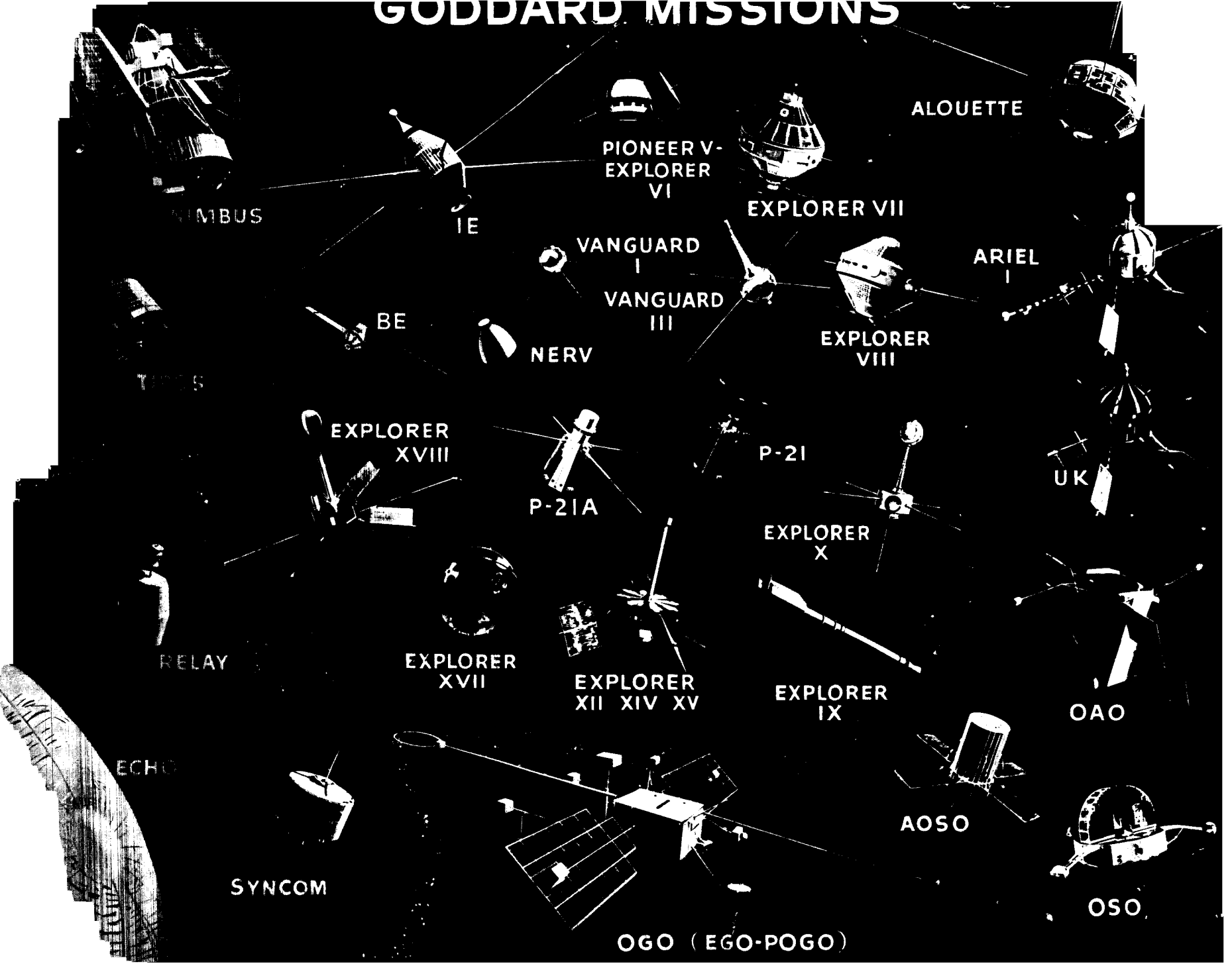
GODDARD PROJECTS SUMMARY

SATELLITES AND SOUNDING ROCKETS

· GODDARD SPACE FLIGHT CENTER · NATIONAL AERONAUTICS AND SPACE ADMINISTRATION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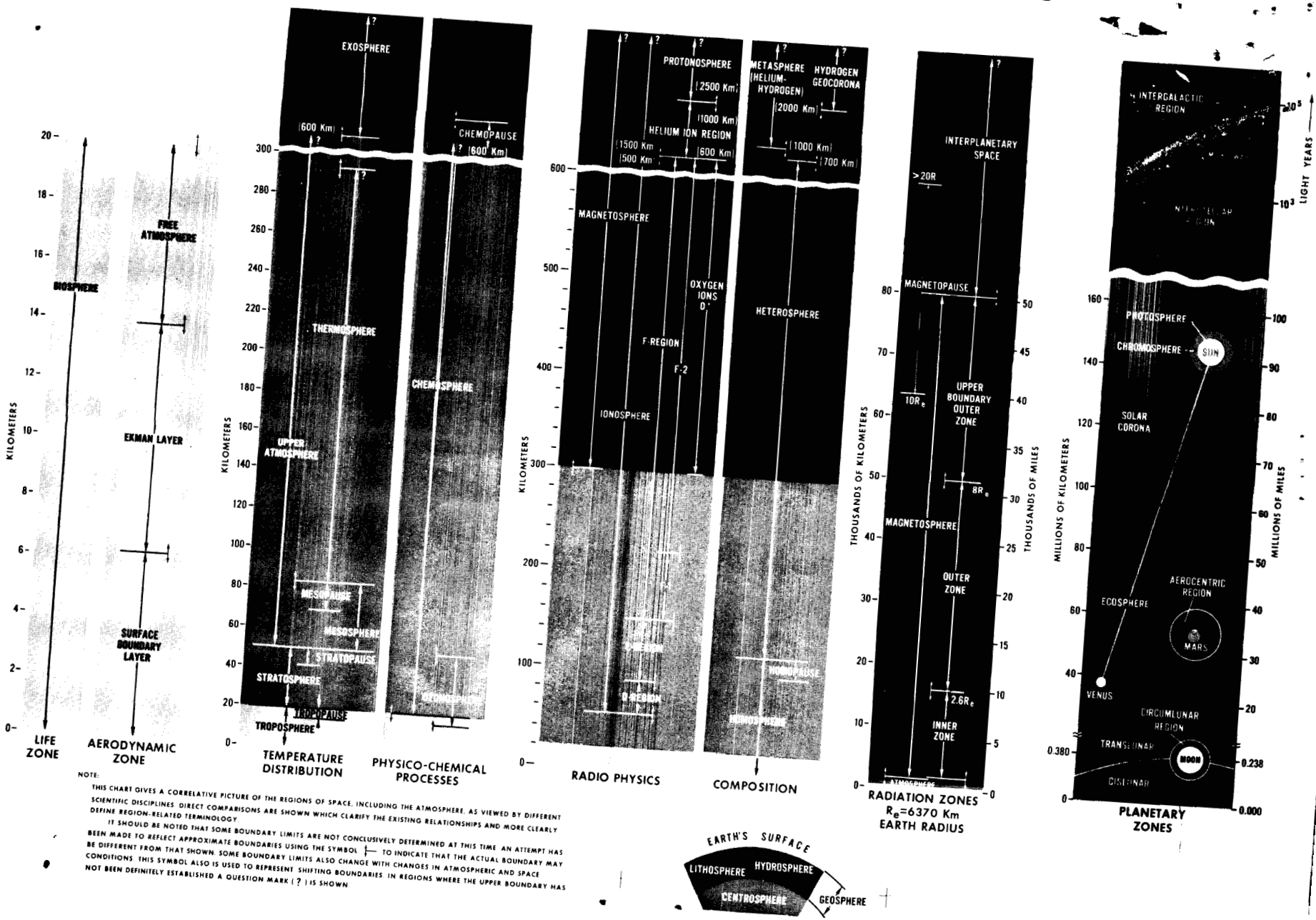
REGIONS OF SPACE VIEWED BY DIFFERENT DISCIPLINES



NOTE:

THIS CHART GIVES A CORRELATIVE PICTURE OF THE REGIONS OF SPACE, INCLUDING THE ATMOSPHERE, AS VIEWED BY DIFFERENT SCIENTIFIC DISCIPLINES. DIRECT COMPARISONS ARE SHOWN WHICH CLARIFY THE EXISTING RELATIONSHIPS AND MORE CLEARLY DEFINE REGION-RELATED TERMINOLOGY.

IT SHOULD BE NOTED THAT SOME BOUNDARY LIMITS ARE NOT CONCLUSIVELY DETERMINED AT THIS TIME. AN ATTEMPT HAS BEEN MADE TO REFLECT APPROXIMATE BOUNDARIES USING THE SYMBOL ⊢ TO INDICATE THAT THE ACTUAL BOUNDARY MAY BE DIFFERENT FROM THAT SHOWN. SOME BOUNDARY LIMITS ALSO CHANGE WITH CHANGES IN ATMOSPHERIC AND SPACE CONDITIONS. THIS SYMBOL ALSO IS USED TO REPRESENT SHIFTING BOUNDARIES. IN REGIONS WHERE THE UPPER BOUNDARY HAS NOT BEEN DEFINITELY ESTABLISHED A QUESTION MARK (?) IS SHOWN.

GODDARD SPACE FLIGHT CENTER SATELLITE AND SPACE PROBE PROJECTS

Designation	Objectives	LAUNCH AND ORBIT DATA					Project Manager and Project Scientist	EXPERIMENT DATA				Remarks
		Launch Date/ Silent Date	Vehicle & Launch Site	Period (Min.)	Statute Miles			Instrumentation Summary	Experiment and Discipline*	Experimenter	Affiliation	
					Perigee	Apogee						
EXPLORER VI 1959 Delta 1 S-2	To measure three specific radiation levels of earth's radiation belts; test scanning equipment for earth's cloud cover; map earth's magnetic field; measure micrometeorites; study behavior of radiowaves.	Aug. 7, 1959 Oct. 6, 1959	Thor-Able AMR	12-½ hours	156	27,357	Dr. John C. Lindsay Dr. John C. Lindsay	Equipment to measure radiation levels; TV-type scanner; micrometeorite detector; two types of magnetometers and devices for space communication experiments.	Triple coincidence Telescopes–A Scintillation counter–E Ionization chamber Geiger counter–E Spin-coil magnetometer–E Fluxgate magnetometer–E Aspect sensor Image-scanning television system Micrometeorite detector–P	J. A. Simpson C. Y. Fan P. Meyer T. A. Farley Allen Rosen C. P. Sonnett J. Winckler E. J. Smith D. L. Judge P. J. Coleman	U. of Chicago STL U. of Minn. STL STL STL STL Cambridge Research/ STL	Orbit achieved. All experiments performed. First complete televised cloud-cover picture was obtained. Detected large ring of electrical current circling earth; first detailed study of region now known as the Van Allen radiation belt. Weight: 142 lb. Power: Solar
VANGUARD III 1959 Eta	To measure the earth's magnetic field, X-radiation from the sun and several aspects of the space environment through which the satellite travels.	Sep. 18, 1959 Dec. 12, 1959	Vanguard AMR	130	319	2329		Proton precisional magnetometer, ionization chambers for solar X-rays, micrometeorite detectors and thermistors.	Proton magnetometer–E Ionization chambers–E Environmental measurements	J. P. Heppner H. Friedman H. E. LaGow	GSFC NRL GSFC	Orbit achieved. Provided comprehensive survey of earth magnetic field over area covered; surveyed location of lower edge of Van Allen radiation belt. Accurate count of micrometeorite impacts. Power: Solar
EXPLORER VII 1959 Iota 1 S-1a	Variety of experiments, including solar ultraviolet; X-ray; cosmic-ray, earth radiation and micrometeor experiments.	Oct. 13, 1959 Aug. 24, 1961	Juno II AMR	101.33	342	680	H. LaGow	Sensors for measurements of earth-sun heat balance; Lyman-Alpha and X-ray solar radiation detectors; micrometeorite detectors, Geiger-Mueller tubes for cosmic ray count; ionization chamber for heavy cosmic rays.	Thermal radiation balance Solar X-ray and Lyman-Alpha–S Heavy cosmic radiation–E Radiation and solar-proton observation–E Ground-based ionospheric observations–I	V. Suomi H. Friedman R. W. Kreplin T. Chubb G. Groetzinger P. Schwed M. Pomerantz J. Van Allen G. Ludwig H. Whelpley G. Swenson C. Little G. Reid O. Villard, Jr. W. Ross	U. of Wisc. NRL Martin Co. Bartol Research St. U. of Iowa U. of Illinois Nat. Bu. of Stan. U. of Alaska Stanford U. Penn State U.	Orbit achieved. Provided significant geophysical information on radiation and magnetic storms; demonstrated method of controlling internal temperatures; first micrometeorite penetration of a sensor in flight. Weight: 91.5 lb. Power: Solar

AFFILIATIONS

AFCRL	Air Force Cambridge Research Lab.
ARC	Ames Research Center
BTL	Bell Telephone Labs.
CRPL	Central Radio Propagation Lab.
DRTE	Defence Research Telecommunications Establishment
DSIR	Department of Scientific and Industrial Research
GSFC	Goddard Space Flight Center
JPL	Jet Propulsion Lab.
MIT	Massachusetts Institute of Technology
NRC	National Research Council
NRL	Naval Research Lab.
STL	Space Technology Labs.

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PART I

GODDARD SPACE FLIGHT CENTER SATELLITE AND SPACE PROBE PROJECTS (Cont.)

Designation	Objectives	LAUNCH AND ORBIT DATA					Project Manager and Project Scientist	EXPERIMENT DATA				Remarks
		Launch Date/ Silent Date	Vehicle & Launch Site	Period (Min.)	Statute Miles Perigee	Statute Miles Apogee		Instrumentation Summary	Experiment and Discipline*	Experimenter	Affiliation	
S-1a (Continued)									Micrometeorite penetration experiment–P	W. Dyke H. LaGow	Linfield Res. Inst. GSFC	
PIONEER V 1960 Alpha	Investigate interplanetary space between orbits of earth and Venus, test extreme long-range communications, study methods for measuring astronomical distances.	Mar. 11, 1960 June 26, 1960	Thor-Able AMR	311.6 days	Perihelion 74.9 million from sun	Aphelion 92.3 million from sun	Dr. John C. Lindsay Dr. John C. Lindsay	High-intensity radiation counter, ionization chamber Geiger-Mueller tube to measure plasmas, cosmic radiation and charged solar particles. Magnetometer and micrometeorite temperature measurements.	Triple coincidence proportional counter cosmic-ray telescope–E Search-coil-magnetometer and photo-electric cell aspect indicator–E Ionization chamber and G-M tube–E Micrometeorite counter–P	J. Simpson D. Judge J. Winckler E. Manring	U. of Chicago STL U. of Minn. AFCRL	Highly successful exploration of interplanetary space between orbits of earth and Venus; established communication record of 22.5 million miles on June 26, 1960; made measurements of solar flare effects, particle energies and distribution, and magnetic-field phenomena in interplanetary space. Weight: 94.8 lb. Power: Solar
TIROS I Beta 1960 A-1	Test of experimental television techniques leading to eventual worldwide meteorological information system.	April 1, 1960 June 16, 1960	Thor-Able AMR	99.1	428.7	465.9	W. G. Stroud H. Butler	One wide and one narrow angle camera, each with tape recorder for remote operation. Picture data can be stored on tape or transmitted directly to ground stations.	TV camera systems (2)			Provided first global cloud-cover photographs (22,952 total) from near-circular orbit. Weight: 270 lb. Power: Solar
ECHO I 1960 Iota	Place 100-foot inflatable sphere into orbit; measure reflective characteristics of sphere and propagation; study effects of space environment.	Aug. 12, 1960 Passive satellite	Thor-Delta AMR	118.3	945	1049	R. J. Mackey	Two tracking beacons 107.94 Mc and 107.97 Mc	Communications	JPL BTL NRL		Demonstrated use of radio reflector for global communications, numerous successful transmissions. Visible to the naked eye. Orbit characteristics perturbed by solar pressure due to high area-to-mass ratio. Still in orbit. Weight: 132 lb. (including inflation powder) Power: Passive
EXPLORER VIII 1960 Xi S-30	Investigation of the ionosphere by direct measurement of positive ion and electron composition; collect data on the frequency, momentum, and energy of micrometeorite	Nov. 3, 1960 Dec. 28, 1960	Juno II AMR	112.7	258	1423	Robert E. Bourdeau Robert E. Bourdeau	RF-impedance probe using a 20-foot dipole sensor; single-grid ion trap; four multiple-grid ion traps; Langmuir probe experiment, rotating shutter electric field meter; micro plier;	RF impedance–I Ion traps–I	J. Cain R. Bourdeau G. Serbu E. Whipple J. Donley	GSFC GSFC	Measure the electron-density temperature, ion density and composition, and charge on the satellite in the upper ionosphere. The micrometeorite

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GODDARD SPACE FLIGHT CENTER SATELLITE AND SPACE PROBE PROJECTS (Cont.)

Designation	Objectives	LAUNCH AND ORBIT DATA					Project Manager and Project Scientist	EXPERIMENT DATA				Remarks
		Launch Date/ Silent Date	Vehicle & Launch Site	Period (Min.)	Statute Miles			Instrumentation Summary	Experiment and Discipline*	Experimenter	Affiliation	
					Perigee	Apogee						
EXPLORER VIII (Continued)	impacts; establish the attitude of the base of the exosphere.							micrometeorite microphone; thermistors for reading internal and surface temperatures of the spacecraft, and despin mechanisms to reduce spin from 450 to 30 rpm.	Langmuir probe–I Rotating-shutter electric field meter–I Micrometeorite photomultiplier–I Micrometeorite microphone–I	R. Bourdeau G. Serbu E. Whipple J. Donley J. Donley M. Alexander C. McCracken O. Berg M. Alexander C. McCracken	GSFC GSFC GSFC GSFC	influx rate was measured. Weight: 90.14 lb. Power: Battery
TIROS II 1960 Pi 1 A-2	Test of experimental television techniques and infrared equipment leading to eventual world-wide meteorological information system.	Nov. 23, 1960 July 12, 1961	Delta AMR	98.2	406	431	Dr. R. Stampfl	Included one wide and one narrow angle camera, each with tape recorder for remote operation; infrared sensors to map radiation in various spectral bands; attitude sensors; experimental magnetic orientation control.	TV camera systems (2) Widefield radiometer experiment Scanning radiometer experiment	W. Nordberg R. Hanel	GSFC GSFC	Orbit achieved. Narrow-angle camera and IR instrumentation sent good data. Transmitted 36,156 pictures. Still operative. Weight: 277 lb. Power: Solar
EXPLORER IX 1961 Delta I S-56a (A project of the Langley Research Center with GSFC participation)	To study performance, structural integrity, and environmental conditions of Scout research vehicle and guidance controls system. Inject inflatable sphere into earth orbit to determine density of atmosphere.	Feb. 16, 1961 Passive satellite	Scout Wallops Island	118.3	395	1605		Radio beacon on balloon and in fourth stage.				Vehicle functioned as planned. Balloon and fourth stage achieved orbit. Transmitter on balloon failed to function properly requiring optical tracking of balloon. Weight: 80 lb. Power: Passive
EXPLORER X 1961 Kappa P-14	Gather definite information on earth and interplanetary magnetic fields and the way these fields effect and are affected by solar plasma.	March 25, 1961 March 27, 1961	Thor-Delta AMR	112 hours	100	186,000	Dr. J. P. Heppner Dr. J. P. Heppner	Included rubidium vapor magnetometer, two flux-gate magnetometers, a plasma probe, and an optical aspect sensor.	Rubidium-vapor magnetometer and flux-gate magnetometers–E Plasma probe–E Spacecraft attitude experiment	J. P. Heppner T. L. Skillman C. S. Scearce H. Bridge F. Scherb B. Rossi J. Albus	GSFC MIT GSFC	Probe transmitted valuable data continuously for 52 hours as planned. Demonstrated the existence of a geomagnetic cavity in the solar wind and the existence of solar proton streams transporting solar interplanetary magnetic fields past the earth's orbit. Weight: 79 lb. Power: Battery

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Designation	Objectives	LAUNCH AND ORBIT DATA					Project Manager and Project Scientist	EXPERIMENT DATA				Remarks
		Launch Date/ Silent Date	Vehicle & Launch Site	Period (Min.)	Statute Miles			Instrumentation Summary	Experiment and Discipline*	Experimenter	Affiliation	
					Perigee	Apogee						
EXPLORER XI 1961 Nu 1 S-15	Orbit a gamma-ray astronomy telescope satellite to detect high-energy gamma rays from cosmic sources and map their distribution in the sky.	April 27, 1961 Dec. 6, 1961	Juno II AMR	108.1	308	1113.2	Dr. J. Kupperian, Jr. Dr. J. Kupperian, Jr.	Gamma-ray telescope consisting of a plastic scintillator, crystal layers, and a Cerenkov detector; sun and earth sensors; micrometeorite shields; temperature sensor; damping mechanism.	Gamma-ray telescope–E	W. Kraushaar G. Clark	MIT	Orbit achieved. Detected first gamma rays from space. Directional flux obtained. Disproved one part of "steady state" evolution theory. Weight: 82 lb. Power: Solar
TIROS III 1961 Rho 1 A-3	Develop satellite weather observation system; obtain photos of earth's cloud cover for weather analysis; determine amount of solar energy absorbed, reflected and emitted by the earth.	July 12, 1961 Feb. 1962	Delta AMR	100.4	461.02	506.44	R. Rados	Two wide-angle cameras, two tape recorders and electronic clocks, infrared sensors, five transmitters, attitude sensors, magnetic attitude coil.	Omnidirectional radiometer Widefield radiometer experiment Scanning radiometer experiment TV cameras (2)	V. Suomi R. Hanel W. Nordberg	U. of Wisc. GSFC GSFC	Orbit achieved. Cameras and IR instrumentation transmitted good data. Transmitted 35,033 pictures. Weight: 285 lb. Power: Solar
EXPLORER XII ENERGETIC PARTICLES EXPLORER 1961 Upsilon 1	Investigate solar wind, interplanetary magnetic fields, distant portions of earth's magnetic field, energetic particles in interplanetary space and in the Van Allen belts.	Aug. 15, 1961 Dec. 6, 1961	Thor-Delta AMR	26.45 hours	180	47,800	Paul Butler Dr. F. McDonald	Ten particle detection systems for measurement of protons and electrons and three orthogonally mounted fluxgate sensors for correlation with the magnetic fields, optical aspect sensor, and one transmitter. PFM telemetry transmitting continuously.	Two mass spectrometers–P Four vacuum (pressure) gauges–P Two electrostatic probes–I	C. Reber R. Horowitz G. Newton N. Spencer L. Brace	GSFC GSFC GSFC	Orbit achieved; all instrumentation operated normally. Ceased transmitting on Dec. 6, 1961, after sending 2568 hours of real-time data. Provided significant geophysical data on radiation and magnetic fields. Weight: 83 lb. Power: Solar
EXPLORER XIII 1961 Chi 1 (A project of the Langley Research Center with GSFC participation)	Test performance of the vehicle and guidance; investigate nature and effects on space flight of micrometeoroids.	Aug. 25, 1961 Aug. 27, 1961	Scout Wallops Island	97.5	74	722	C. T. D'Aiutolo	Micrometeoroids impact detectors; transmitters.	A cadmium sulphide photoconductor experiment–A A wire grid experiment	M. W. Alexander L. Secretan	GSFC	Orbit was lower than planned. Reentered August 27, 1961. Weight: 187 lb. including 50-lb. 4th stage and 12-lb. transition section. Power: Solar
P-21 ELECTRON DENSITY PROFILE PROBE P-21	To measure electron densities and to investigate radio propagation at 12.3 and 73.6 Mc under daytime conditions.	Oct. 19, 1961 Oct. 19, 1961	Scout Wallops Island				John E. Jackson Dr. S. J. Bauer	Continuous-wave propagation experiment for the ascent portion of the trajectory, and an RF-probe technique for the descent.	RF probe–I CW propagation–I	H. Whale G. H. Spaid J. E. Jackson	GSFC GSFC GSFC	Probe achieved altitude of 4261 miles and transmitted good data. Electron density was obtained to about 1500 miles, the first time such measurements had been taken at this altitude.

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		Launch Date/ Silent Date	Vehicle & Launch Site	Period (Min.)	Statute Miles			Instrumentation Summary	Experiment and Discipline*	Experimenter	Affiliation	
					Perigee	Apogee						
P-21 (Continued)												Weight: 94 lb. Power: Battery
TIROS IV 1962 Beta A-9	Develop principles of weather satellite system; obtain cloud and radiation data for use in meteorology.	Feb. 8, 1962 June 19, 1962	Delta AMR	100.4	471	525	R. Rados	Two TV camera systems with clocks and recorders for remote pictures, infrared sensors, heat budget sensors, magnetic orientation control horizon sensor, north indicator.	Omnidirectional radiometer Widefield radiometer experiment Scanning radiometer TV camera systems (2)	V. Suomi R. Hanel W. Nordberg	U. of Wisc. GSFC GSFC	Orbit achieved. All systems operated properly. Tegea Kinoptic lens used on one camera, Elgeet lens on the other. Supported Project Mercury. Weight: 285 lb. Power: Solar
ORBITING SOLAR OBSERVATORY 1962 Zeta OSO-1	Measure solar electromagnetic radiation in the ultraviolet, X-ray and gamma-ray regions; investigate effect of dust particles on surfaces of spacecraft.	March 7, 1962 Aug. 6, 1963	Delta AMR	96.15	343.5	369	Dr. John C. Lindsay Dr. John C. Lindsay	Devices to conduct 13 different experiments for study of solar electro-magnetic radiations; investigate dust particles in space and thermoradiation characteristics of spacecraft surface materials.	X-ray spectrometer–S 0.510 Mev gamma-ray monitoring; 20-100 kev X-ray monitoring; 1-8A X-ray monitoring–S Dust particle experiment–E Solar radiation experiment, solar ultraviolet–A Solar gamma rays, high energy distribution–A Solar gamma rays, low energy distribution–A Solar gamma rays, high energy distribution–A Neutron monitor experiment–E Lower Van Allen belt–E Emissivity stability of surfaces in a vacuum environment–E	W. Behring W. Neupert K. Frost W. White M. Alexander C. McCracken W. White K. Hallam W. White K. Frost J. R. Winkler L. Peterson M. Savedoff G. Fazio W. Hess S. Bloom G. Robinson	GSFC GSFC GSFC GSFC GSFC U. of Minnesota U. of Rochester U. of Calif. U. of Calif. ARC	Orbit achieved. Experiments transmitted as programmed. Weight: 458 lb. Power: Solar
P21A ELECTRON DENSITY PROFILE PROBE	To measure electron density profile, ion density, and intensity of ions in the atmosphere.	March 29, 1962 March 29, 1962	Scout Wallops Island				John E. Jackson Dr. S. J. Bauer	A continuous-wave propagation experiment to determine electron density and associated parameters of ionosphere. A swept-frequency probe for direct measurements of electron density and a positive ion experiment to determine ion concentration under nighttime conditions.	CW propagation–I RF probe–I Ion traps–I	S. Bauer H. White R. Bourdeau E. Whipple J. Donley G. Serbu	GSFC GSFC GSFC	Probe achieved altitude of 3910 miles. Afforded nighttime observations. Determined that characteristics of the ionosphere differ drastically from daytime state when the temperature of the ionosphere is much cooler. (See P-21) Weight: 94 lb. Power: Battery

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		Launch Date/ Silent Date	Vehicle & Launch Site	Period (Min.)	Statute Miles			Instrumentation Summary	Experiment and Discipline*	Experimenter	Affiliation	
					Perigee	Apogee						
ARIEL 1 INTERNATIONAL SATELLITE 1962 Omicron 1 (UK-1)	To study ionosphere and cosmic rays relationship.	April 26, 1962 Active	Delta AMR	100.9	242.1	754.2	R. C. Baumann Robert E. Bourdeau	Electron density sensor, electron temperature gauge, solar aspect sensor, cosmic ray detector, ion mass sphere, Lyman-alpha gauges, tape recorder, X-ray sensors.	Electron density sensor–I Electron temperature gauge–I Cosmic-ray detector–E Ion mass sphere–I Lyman-alpha gauge–I X-ray emission–I	J. Sayers R. L. F. Boyd H. Elliot R. L. F. Boyd R. L. F. Boyd R. L. F. Boyd	U. of Birmingham, (U.K.) U. College London (U.K.) Imperial College London (U.K.) U. College London (U.K.) U. College London (U.K.) U. College London (U.K.)	Orbit achieved. All experiments except Lyman-alpha transmitting as programmed. First international satellite. Contained six British experiments launched by American Delta vehicle. Weight: 150 lb. Power: Solar
TIROS V 1962 Alpha Alpha 1 A-50	Develop principles of weather satellite system; obtain cloud cover data for use in meteorology.	July 19, 1962 May 4, 1963	Delta AMR	100.5	367	604	R. Rados	Two TV camera systems with tape recorders for recording remote picture areas, magnetic orientation control, horizon sensor, north indicator.	TV camera systems (2)			Launched at a higher inclination (58°) than previous TIROS satellites to provide greater coverage. Time of launch chosen to include normal hurricane season for South Atlantic. One TV system transmitted good data for 10½ months. Weight: 285 lb. Power: Solar
TELSTAR NO. 1 (A project of AT&T) 1962 Alpha Epsilon 1	Joint AT&T-NASA investigation of wideband communications.	July 10, 1962 Feb. 21, 1963	Delta AMR	157.8	592.6	3503.2	C. P. Smith, Jr.	The system provided TV, radio, telephone and data transmission via a satellite repeater system.	Included electron detector for range 250,000-1 Mev; proton detectors in the following energy ranges: 2.5-25.0 Mev, ranges greater than 50 Mev	W. Brown	BTL	Orbit achieved. Television and voice transmissions were made with complete success. BTL provided spacecraft and ground stations facilities. Government was reimbursed for cost incurred. Conducted more than 300 technical tests and over 400 demonstrations; 50 TV programs–5 in color. Weight: 175 lb. Power: Solar
TIROS VI 1962 Alpha Psi 1 A-51	To study cloud cover and earth heat balance; measurement of radiation in selected spectral regions as part of a program to develop meteorological satellite systems.	Sep. 18, 1962 Oct. 11, 1963	Delta AMR	98.73	425	442	R. Rados	Two TV camera systems (78° and 104° lens), clocks and tape recorders for remote operation, infrared and attitude sensors, magnetic attitude coil.	TV camera systems (2)			Inclination 58.3°; velocity at perigee 16,822; apogee, 16,756. Medium-angle camera failed Dec. 1, 1962 after taking 1074 pictures. TV camera

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Designation	Objectives	LAUNCH AND ORBIT DATA					Project Manager and Project Scientist	EXPERIMENT DATA				Remarks
		Launch Date/ Silent Data	Vehicle & Launch Site	Period (Min.)	Statute Miles			Instrumentation Summary	Experiment and Discipline*	Experimenter	Affiliation	
					Perigee	Apogee						
TIROS VI (Continued)												provided good data for 13 months after launch. Weight: 300 lb. Power: Solar
ALOUETTE I SWEPT FREQUENCY TOPSIDE SOUNDER (Canada) 1962 Beta Alpha 1	To measure the electron density distribution in the ionosphere between the satellite height (620 miles) and the F2 peak (approx. 180 miles) and to study for a period of a year the variations of electron density distribution with time of day and with latitude under varying magnetic, and auroral conditions with particular emphasis on high-latitude effects. Other objectives were to obtain galactic noise measurements, study the flux of energetic particles, and to investigate whistlers.	Sep. 29, 1962 Active	Thor-Agena PMR	105.4	620	638	John E. Jackson	The satellite was spin stabilized and contained a swept-frequency pulse sounder covering the frequency range 0.5 to 11.5 Mc. Sounder data was transmitted via a two-watt FM telemetry system. Data from the other experiments and housekeeping data was transmitted through a ¼-watt PM telemetry system. There were two sets of sounder antennas, the longest set measuring 150 ft. tip-to-tip. Data was acquired on command and in real time only.	Topside sounder–I Energetic particle counters–E VLF receiver (whistler)–I Cosmic noise experiment–A	E. S. Warren G. L. B. Nelms G. E. Lockwood E. L. Hagg L. E. Petrie D. B. Muldrew R. W. Knecht T. E. Van Zandt W. Calvert J. W. King S. J. Bauer L. Blumle R. Fitzenreiter J. E. Jackson D. C. Rose I. B. McDiarmid J. S. Belrose T. R. Hartz	DRTE CRPL/NBS DSIR England GSFC NRC Canada DRTE DRTE	The Alouette satellite is a project of the Canadian Defence Research Board. This international project is a part of NASA's topside sounder program and was the first NASA launched satellite from the PMR. Alouette has the distinction of being the first spacecraft designed and built by any country other than the U.S. and the USSR. After almost 2 years in orbit, the satellite has experienced no failures and its operation was nominal. Weight: 320 lb. Power: Solar
EXPLORER XIV ENERGETIC PARTICLES SATELLITE 1962 Beta Gamma 1 EPE-B	Correlate energetic particles activity with observations of the earth's magnetic fields; monitor the existence of transient magnetic fields associated with plasma streams.	Oct. 2, 1962 Feb. 1964	Delta AMR	36.58 hours	184	54,123	Paul G. Marcotte Dr. Frank B. McDonald	A low-energy (0.1 to 20 kev) proton analyzer; a three-core magnetometer; one omnidirectional and three directional electron proton detectors; a three-basic-unit cosmic-ray package; an ion-electron scintillation detector; and devices to determine the effects of radiation on solar cells and the effects of space on electrolytic timers.	Proton analyzer–E Magnetic field experiment (magnetometer)–E Trapped-particle radiation experiment–E Cosmic-ray experiment, ion-electron detector experiment, solar-cell experiment, electrolytic timer experiment–E	M. Bader L. Cahill J. A. Van Allen B. J. O'Brien F. B. McDonald L. R. Davis U. Desai	ARC U. of New Hampshire State U. of Iowa GSFC	Velocity at apogee 1507 mph; perigee 23,734 mph. Inclination to equator 33°. Weight: 89.25 lb. Power: Solar
EXPLORER XV 1962 B-Lambda 1	To study artificial radiation belt created by nuclear explosion.	Oct. 27, 1962 Feb. 9, 1963	Delta AMR	5 hours (C. 315 min.)	195	10,950	Dr. John W. Townsend Dr. Wilmot Hess	Similar to Explorer XII.	Electron energy distribution–I Omnidirectional detector–I Angular distributor–E Directional detector–I	W. Brown U. Desai C. McIlwain W. Brown C. McIlwain	BTL GSFC U. of Calif. BTL U. of Calif.	Good data received on artificial radiation belt. Weight: 100 lb. Power: Solar

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					Perigee	Apogee						
EXPLORER XV (Continued)									Ion-electron detector–E Magnetic field experiment–E Solar cell damage experiment–I	L. Davis L. Cahill H. K. Gummel	GSFC U. of New Hampshire BTL	
RELAY 1962 B-Upsilon 1 A-15	To investigate wide-band communications between ground stations by means of low altitude orbiting spacecraft. Communications signal to be evaluated will be an assortment of TV signals, multichannel telephony and other communications. To measure the effects of the space environment on the system; to include radiation damage to solar cells and radiation flux density. To provide tests and demonstration of low-altitude communications satellite.	Dec. 13, 1962 Active	Delta AMR	185.09	819.64	4612.18	Wendell Sunderlin Dr. Ramond Waddel	The spacecraft contained an active communications repeater to receive and retransmit communications between the U.S. and Europe, U.S. and South America, and Europe and South America; and an experiment to assess radiation damage to solar cells, and to measure proton and electron energy.	Determine radiation damage to solar cells and semiconductor diodes–E Measure proton energy (2.5-25.0 Mev)–E Measure electron energy (0.6-1.6 Mev)–E Measure integral omni-directional proton flux energy (35.0-300.0 Mev)–E Measure directional electron energy (0.25-1.0 Mev)–E Measure directional proton energy (1.0-60.0 Mev)–E	R. Waddel W. Brown W. Brown C. McIlwain C. McIlwain C. McIlwain	GSFC BTL BTL U. of Calif. U. of Calif. U. of Calif.	Orbit achieved. TV, telephone, teletype, facsimile and digital data transmissions were made with very satisfactory results. Conducted more than 1600 technical tests and 99 successful demonstrations. Weight: 172 lb. Power: Solar
SYNCOM I 1963 4A A-25	To provide experience in using communications satellites in a 24-hour orbit. To flight test a new, simple approach to satellite attitude and period control. To develop transportable ground facilities to be used in conjunction with communications satellites. To develop capability of launching satellites into 24-hour orbit using existing vehicles, plus apogee kick techniques and to test components life at 24-hour orbit altitude.	Feb. 14, 1963 Feb. 14, 1963	Delta AMR	24 hours	Near synchronous orbit	22,300	R. J. Darcey	The 24-hour communications satellite consists of a spin-stabilized active repeater in a near synchronous, low inclination orbit. The spacecraft is in the form of a cylinder 28 inches in diameter and 15 inches high. The repeater consists of a 7,200-Mc reveiver and an 1,800-Mc transmitter with an output of two watts. In addition, the spacecraft contains a vernier velocity control system for orientation of spin axis and adjustment of the orbit.				Twenty seconds after firing apogee rocket, all satellite transmissions stopped. The satellite was sighted on Feb. 28, 1963 and later dates. It was travelling in a near synchronous orbit eastward at about 2.8° per day. Weight: 78 lb. Power: Solar
EXPLORER XVII ATMOSPHERE EXPLORER 1963 9A	To measure the density, composition, pressure, and temperature of the earth's atmosphere from 135 to 540 nautical miles and to determine the variations of these	April 2, 1963 July 10, 1963	Delta AMR	96.4	158.1	598.5	N. W. Spencer	Primary detectors to be employed (two each) are: Double focusing magnetic sector mass spectrometer, hot-cathode total-pressure ionization gauges and cold-cathode total pressure ionization	Two mass spectrometers–P Four vacuum (pressure) gauges–P Two electrostatic probes–I	C. Reber R. Horowitz G. Newton N. Spencer L. Brace	GSFC GSFC GSFC GSFC	Confirmed that the earth is surrounded by a belt of neutral helium at an altitude of from 150 to 600 miles. Weight: 405 lb. Power: Silver zinc batteries

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GODDARD SPACE FLIGHT CENTER SATELLITE AND SPACE PROBE PROJECTS (Cont.)

Designation	Objectives	LAUNCH AND ORBIT DATA					Project Manager and Project Scientist	EXPERIMENT DATA				Remarks
		Launch Date/ Silent Date	Vehicle & Launch Site	Period (Min.)	Statute Miles			Instrumentation Summary	Experiment and Discipline*	Experimenter	Affiliation	
					Perigee	Apogee						
EXPLORER XVII (Continued)	parameters with time of day, latitude and in part, season.							gauges. The remaining satellite instrumentation converts the outputs from six detectors to radio signals.				
TELSTAR II 1963 13A (A project of AT&T)	Joint AT&T–NASA investigation of wideband communications.	May 7, 1963 Active	Delta AMR	221	575	6559	C. P. Smith, Jr.	The system provides for TV, radio, telephone and data transmission via a satellite repeater system.	Included electron detector for energy range 750,000 to 2 Mev			Contained "evacuated" transistors in one of the encoders. Weight: 175 lb. Power: Solar
TIROS VII 1963 24A A-52	To launch into orbit a satellite capable of viewing cloud cover and the earth's surface and atmosphere by means of television cameras and radiation sensors. To acquire and process collected data from satellite and to control its attitude by magnetic means.	June 19, 1963 Active	Delta AMR	97.4	385.02	401.14	R. Rados	Two vidicon cameras each with a wide-angle lens, five-channel medium-resolution scanning radiometer, omnidirectional low-resolution radiometer, electron temperature probe, magnetic attitude coil.	Omnidirectional radiometer Scanning radiometer Electron temperature experiment	V. Suomi A. McCulloch N. Spencer	U. of Wisc. GSFC GSFC	Inclination: 58° to equator. TV coverage extended to 65° north and 65° south latitudes. Launch date selected to provide maximum northern hemisphere coverage during 1963 hurricane season. Electron temperature probe malfunctioned 26 days after launch. First TIROS to have two operational camera systems and fully functioning IR subsystem 10 months after launch. Weight: 297 lb. Power: Solar
SYNCOM II 1963 31A A-26	To provide experience in using communications satellites in a 24-hour orbit. To flight test a new, simple approach to satellite attitude and period control. To develop transportable ground facilities to be used in conjunction with communication satellites. To develop capability of launching satellites into 24-hour orbit using existing vehicles, plus apogee kick techniques, and to test components life at 24-hour orbit altitude.	July 26, 1963 Active	Delta AMR	24 hours	Near synchronous orbit	22,300	R. J. Darcey	The 24-hour communications satellite consists of a spin-stabilized active repeater in a near synchronous, low inclination orbit. The spacecraft is in the form of a cylinder 28 inches in diameter and 15 inches high. The repeater consists of a 7,200-Mc receiver and an 1,800-Mc transmitter with an output of two watts. In addition, the spacecraft contains a vernier velocity control system for orientation of spin axis and adjustment of the orbit.				Orbit and attitude control of the spin-stabilized synchronous satellite achieved. Data, telephone, and facsimile transmission were excellent. Television video signals were also successfully transmitted, even though the satellite was not designed for this capability. Weight: 70 lb. Power: Solar

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GODDARD SPACE FLIGHT CENTER SATELLITE AND SPACE PROBE PROJECTS (Cont.)

Designation	Objectives	LAUNCH AND ORBIT DATA					Project Manager and Project Scientist	EXPERIMENT DATA				Remarks
		Launch Date/ Silent Date	Vehicle & Launch Site	Period (Min.)	Statute Miles			Instrumentation Summary	Experiment and Discipline*	Experimenter	Affiliation	
					Perigee	Apogee						
EXPLORER XVIII INTERPLANETARY EXPLORER PLATFORM 1963 46A (IMP)	A detailed study of the radiation environment of cislunar space and monitoring this region over a significant portion of a solar cycle. To study the quiescent properties of the interplanetary magnetic field and its dynamical relationships with particle fluxes from the sun. Development of a solar flare prediction capability for Apollo. The extension of knowledge of solar-terrestrial relationships. To further the development of simple, inexpensive, spin-stabilized spacecraft for interplanetary investigations.	Nov. 27, 1963 Active	Delta AMR	93 hours	122	121,605	P. Butler Dr. F. B. McDonald	To carry 10 experiments; essentially a combination of the successful GSFC Explorer X and XII satellites. It is spin-stabilized and powered by solar cells. The system is designed so that data can be received from apogee by the GSFC Minitrack stations.	Plasma–measure thermal ions and electrons 0-10 ev–I Magnetic field experiment (fluxgate magnetometer)–E Measure solar and galactic protons and alpha particles–E Measure total ionization produced per unit time in a unit volume of standard density air–E Measure flux of low energy interplanetary plasma–E Measure solar and galactic protons, electrons, alpha particles, heavy primaries, and isotropy of solar proton events and of cosmic-ray modulation–E Magnetic field experiment (rubidium vapor magnetometer)–E Solar wind proton concentrations experiment–E	G. P. Serbu R. Bourdeau N. F. Ness J. A. Simpson K. A. Anderson H. S. Bridge F. McDonald G. Ludwig N. F. Ness John Wolfe	GSFC GSFC U. of Chicago U. of Calif. MIT GSFC GSFC ARC	All experiments and equipment operating satisfactorily except for thermal ion experiment which is giving only 10 percent good data. Continues to provide significant data since launch. First accurate measure of the interplanetary magnetic field, and the shock front. First satellite to survive a severe earth shadow of 7 hr., 55 min. Electronics equipment estimated to have cooled to below -60°C. Weight: 137.5 lb. Power: 38 watts solar
TIROS VIII 1963 54A	To launch into orbit a satellite capable of viewing cloud cover and the earth's atmosphere by means of television cameras and radiation sensors. To acquire and process collected data from satellite and to control its attitude by magnetic means.	Dec. 2, 1963 Active	Delta AMR	99.35	435.01	468.30	R. Rados	Two vidicon cameras each with a wide-angle lens, five-channel medium-resolution scanning radiometer, omnidirectional low-resolution radiometer, electron temperature probe, magnetic attitude coil.				This satellite proved for the first time the feasibility of APT (Automatic Picture Transmission) a rather "inexpensive" direct facsimile readout. Weight: 297 lb. Power: Solar
RELAY II 1964 3A	To investigate wideband communications between ground stations by means of low altitude orbiting spacecraft. Communications signal to be evaluated will be an assortment of TV signals, multichannel telephony and other communications. To measure also the effects of	Jan. 21, 1964 Active	Delta AMR	194.7	1298	4606	Wendell Sunderlin Dr. Ramond Waddell	The spacecraft contains an active communications repeater to receive and retransmit communications between the U.S. and Europe, U.S. and South America, and Europe and South America; and an experiment to assess radiation damage to solar cells, and to measure proton and electron energy.	Determine radiation damage to solar cells and semiconductor diodes–E Measure proton energy (2.5-25.0 Mev)–E Measure electron energy (0.6-1.6 Mev)–E Measure integral omnidirectional proton flux energy (35.0-300.0 Mev)–E	R. Waddell W. Brown W. Brown C. McIlwain	GSFC BTL BTL U. of Calif.	Weight: 172 lb. Power: Solar Inclination: 46.3°

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Designation	Objectives	LAUNCH AND ORBIT DATA					Project Manager and Project Scientist	EXPERIMENT DATA				Remarks
		Launch Date/ Silent Date	Vehicle & Launch Site	Period (Min.)	Statute Miles			Instrumentation Summary	Experiment and Discipline*	Experimenter	Affiliation	
					Perigee	Apogee						
RELAY II (Continued)	the space environment on the system; to include radiation damage to solar cells and radiation flux density. To provide tests and demonstration of low-altitude communications satellite.								Measure directional electron energy (0.25-1.0 Mev)–E Measure directional proton energy (1.0-60.0 Mev)–E	C. McIlwain C. McIlwain	U. of Calif. U. of Calif.	
ECHO II 1964 4A	To demonstrate a spacecraft deployment and rigidization technique applicable to passive communications satellites.	Jan. 24, 1964 Active	Thor-Agena PMR	109	641	816	Herbert L. Eaker	The satellite is a ridgidized spherical (balloon) constructed of aluminum foil and mylar laminate. The folded balloon was deployed from its container in space and inflated to its full size by a subliming powder. The satellite carries two beacon units, each includes a transmitter and telemetering sensor.				Weight: 650 lb. Inclination: 81.5°
BEACON EXPLORER BE-A	To study for a minimum period of one year the variations of electron density distribution as a function of latitude, and seasonal and diurnal time, under varying magnetic and solar conditions.	Mar. 19, 1964 Mar. 19, 1964	Delta AMR	Note Remarks			Frank T. Martin Robert E. Bourdeau	Four coherent, ultrastable, unmodulated CW transmitters (operating at 20, 40, 41 and 360 Mc) radiate signals from dipole antennas for reception by a world wide network of over 100 observing stations.	Measurement of electron content–I Absorption, Scintillation–I	Frank T. Martin Robert E. Bourdeau	U. of Illinois Penn State U. NBS Stanford U. and international participants	Observing Stations: Stations operated by prime experimenters: a. University of Illinois: Urbana, Illinois; Houghton, Mich.; Baker Lake, Canada; Adak, Alaska b. Pennsylvania State U.: University Park, Pa.; Huancayo, Peru c. Stanford University: Stanford, Calif.; Honolulu, Hawaii; Macapa, Brazil; Guarapes, Brazil; S. J. dos Campos, Brazil; Santiago, Chile; Ushuaia, Argentina d. Central Radio Propagation Laboratory (NBS): Boulder, Colo.; 2 mobile stations within 100-mile radius of Boulder, Colo.

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GODDARD SPACE FLIGHT CENTER SATELLITE AND SPACE PROBE PROJECTS (Cont.)

Designation	Objectives	LAUNCH AND ORBIT DATA					Project Manager and Project Scientist	EXPERIMENT DATA				Remarks
		Launch Date/ Silent Date	Vehicle & Launch Site	Period (Min.)	Statute Miles			Instrumentation Summary	Experiment and Discipline*	Experimenter	Affiliation	
					Perigee	Apogee						
BE-A (Continued)												International Participation: More than 100 international observing ground stations participated in the program. Doppler tracking data both from Antigua and Brazil tracking stations indicated that the satellite did not achieve orbital velocity. The satellite re-entered the earth's atmosphere over the South Atlantic coast of Argentina and disintegrated. This represented the first time the Delta vehicle failed in 23 launch attempts. Weight: 172 lb.
ARIEL II INTERNATIONAL SATELLITE 1964 15A	To continue U.S./ U.K. cooperative satellite program. This is second phase of a three-satellite program. The satellite mission is to make scientific measments using the U.K.-furnished experiments.	Mar. 27, 1964 Active	Scout Wallops Island		180	840	Emil Hymowitz L. Dunkelman	UK-C is designed to perform three experiments: The galactic-noise experiment to record galactic noise in the 0.75- to 3.0-Mc region and to explore the ionosphere. An ozone experiment is to measure the vertical distribution of ozone in the earth's atmosphere. The micrometeorite experiment is to obtain quantitative measurements of particle flux.	Measurement of galactic radio noise in the 0.75-Mc to 3.0-Mc frequency range—I Measure vertical distribution of atmospheric ozone—P Measurement of the micrometeorotd flux—A	F. G. Smith K. H. Stewart R. C. Jennison	U. of Cambridge (U.K.) Air Ministry (U.K.) U. of Manchester. Jodrell Bank (U.K.)	*This satellite is a cooperative U.S.-U.K. effort.* The U.K. was responsible for all flight instrumentation pertaining to the experiments and for data reduction and analysis. The U.S. was responsible for the design, fabrication, and testing of the prototype and flight hardware, except for the experiment requirements. Tracking and data acquisition are a joint responsibility.

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PART II
SCHEDULED SATELLITE PROJECTS
PARTIAL LISTING

Designation	Objectives	LAUNCH AND ORBIT DATA					Project Manager and Project Scientist	EXPERIMENT DATA				Remarks
		Launch Date/ Silent Date	Vehicle & Launch Site	Period (Min.)	Statute Miles			Instrumentation Summary	Experiment and Discipline*	Experimenter	Affiliation	
					Perigee	Apogee						
BEACON EXPLORER BE-B	To study for a minimum period of one year the variations of electron content distribution as a function of latitude, and seasonal and diurnal time, under varying magnetic and solar conditions. To support the beacon experiment by determining the electron density in the vicinity of the spacecraft. To test the feasibility of laser tracking.	1964	Scout PMR	105	625 circular orbit		Frank T. Martin Robert E. Bourdeau	Four coherent, ultra-stable, unmodulated CW transmitters (operating at 20, 40, 41 and 360 Mc) radiate signals from dipole antennas which will be received by a world-wide network of over 100 observing stations. Two electron density probes. Laser corner reflector.	Ionosphere beacon experiment–I Electron density experiment–I Laser tracking experiment	G. W. Swenson W. J. Ross U. K. Garriott R. S. Lawrence L. J. Blumle L. Brace H. Plotkin	U. of Illinois Penn State U. Stanford U. NBS GSFC International participants GSFC GSFC	Observing Stations: Stations operated by prime experimenters: a. University of Illinois: Urbana, Illinois; Houghton, Mich.; Baker Lake, Canada; Adak, Alaska b. Pennsylvania State University: University Park, Pa.; Huancayo, Peru c. Stanford University: Stanford, Calif; Honolulu, Hawaii; Macapa, Brazil; S. J. dos Compos, Brazil; Santiago, Chile; Ushuaia, Argentina d. Central Radio Propagation Laboratory (NBS): Boulder, Colo.: 2 mobile stations within 100-mile radius of Boulder, Colo. e. Goddard Space Flight Center (GSFC): Blossom Point, Maryland f. Laser station at Wallops Island International Participation: More than 80 international observing ground stations will participate in the program. Weight: 115 lb.
IONOSPHERE EXPLORER IE-A	Primary objective is to measure the electron density distribution in space and time between the height of the maximum electron density in the F2 region	1964	Scout PMR		545	620	John E. Jackson	Six ionosphere explorers from 1.50 to 7.22 Mc and an ion mass spectrometer (UK). The longest set of sounding antenna will measure 122 feet tip-to-tip. Scientific	Fixed-frequency sounder–I Ion probe–I	R. Knecht R. L. F. Boyd A. P. Willmore	CRPL/ NBS U. College London, England	26 inches diameter and 32½ inches high. 2,400 solar cells mounted round side of satellite. Weight: 97 lb.

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SCHEDULED SATELLITE PROJECTS (Cont.)
PARTIAL LISTING

Designation	Objectives	LAUNCH AND ORBIT DATA					Project Manager and Project Scientist	EXPERIMENT DATA				Remarks
		Launch Date/ Silent Date	Vehicle & Launch Site	Period (Min.)	Statute Miles			Instrumentation Summary	Experiment and Discipline*	Experimenter	Affiliation	
					Perigee	Apogee						
IE-A (Continued)	(approximately 180 miles) and the height of the satellite (620 miles) including the geometry and number of irregularities. Secondary objectives are to determine the ion and electron densities and temperature in the vicinity of the satellite and to estimate cosmic noise in the 2- to 7-Mc frequency range.							data will be transmitted via a two-watt FM telemetry system; upon command, data will be acquired in real time only. Housekeeping data will be acquired from a ¼-watt PM telemetry transmitter.				
NIMBUS A-4	Provide television coverage of the daytime cloud cover of the entire earth as well as infrared radiation pictures of nighttime cloud cover, reflected radiation, and the heat budget of the earth. Real-time use of the relevant meteorological data will be included.	1964	Thor-Agena PMR	103	500 circular orbit		Harry Press	Television cameras to photograph the earth's cloud cover; equipment for infrared radiation measurements. Two large paddles of solar cells will convert the sun's energy into electric power. Spacecraft also has tape recorders, telemetering and command equipment. Satellite will be earth-stabilized to provide continuous cloud cover data.				Weight: 830 lb.
ORBITING GEOPHYSICAL OBSERVATORY OGO-A	To launch and operate an orbital spacecraft carrying experiments to make scientific geophysical measurements about the earth.	1964	Atlas-Agena B AMR		172	92,124	Wilfred E. Scull Dr. G. H. Ludwig	The spacecraft can accomodate as many as 50 experiments.	Solar cosmic rays–S Plasma, electrostatic analyzer–E Plasma, Faraday cup–E Positron search and gamma-ray spectrum–E, S Trapped radiation, scintillation detector–E Cosmic-ray isotope abundance–E Cosmic-ray spectra and fluxes–E Trapped radiation, omnidirectional counter–E Trapped radiation, electron spectrometer; and ionization chamber–E Triaxial search-coil magnetometer–E	K. A. Anderson J. H. Wolfe H. Bridge T. L. Cline E. W. Hones, Jr. L. R. Davis F. B. McDonald G. H. Ludwig J. A. Simpson C. Y. Fan P. Meyer J. A. Van Allen L. A. Frank J. R. Winckler R. L. Arnoldy E. J. Smith R. E. Holzer	U. of Calif. ARC MIT GSFC Inst. Def. Anal. GSFC GSFC GSFC U. of Chicago U. of Iowa U. of Minnesota JPL UCLA	To be placed in a highly eccentric 31° orbit. Weight: 1000 lb.

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Designation	Objectives	LAUNCH AND ORBIT DATA					Project Manager and Project Scientist	EXPERIMENT DATA				Remarks
		Launch Date/ Silent Date	Vehicle & Launch Site	Period (Min.)	Statute Miles			Instrumentation Summary	Experiment and Discipline*	Experimenter	Affiliation	
					Perigee	Apogee						
OGO-A (Continued)									Rubidium-vapor magnetometer–E	J. P. Heppner	GSFC	
									Spherical ion and electron trap–I	R. C. Sagalyn	AFCRL	
									Planar ion and electron trap–I	E. C. Whipple	GSFC	
									Radio propagation–I	R. S. Lawrence	NBS	
									Atmospheric mass spectrum–R	H. A. Taylor, Jr.	GSFC	
									Interplanetary dust particles–P	W. M. Alexander	GSFC	
									VLF noise and propagation–I	R. A. Helliwell	Stanford U.	
									Radio astronomy–A	F. T. Haddock	U. of Michigan	
									Geocoronal Lyman-Alpha scattering–P	P. W. Mange	NRL	
									Gegenschein photometry–P	C. L. Wolff K. Hallam	GSFC	
ORBITING SOLAR OBSERVATORY OSO-B2 (Under Study)	To conduct experiments in solar physics above the earth's atmosphere; experiments will detect and measure electromagnetic radiation from the sun, and determine their energy levels.	(Under study)	Delta AMR	95 ± 2	345 ± 34 circular orbit		Laurence T. Hogarth Dr. John C. Lindsay	Stabilized platform for solar-oriented scientific instruments. Experiments not requiring fixed orientation with respect to the sun are housed in the spinning-wheel section of the satellite. Electrical power is supplied by an array of solar cells mounted on the stabilized section. A complete telemetry and command system is provided to transmit information back to earth. Essential difference between OSO-I and OSO-B is ability of OSO-B to scan solar disc and corona with pointed instruments.	POINTED			Weight: 542 lb. (317 for spacecraft and 225 for experiments) Power: Solar Inclination: 33°
									Ultraviolet spectrometer–heliograph 300-1400A–S	L. Goldberg E. M. Reeves W. H. Parkinson W. Liller	Harvard U.	
									Monitor solar X-ray bursts–S	T. A. Chubb	NRL	
									White light coronagraph–S	R. Tousey	NRL	
									WHEEL			
									Monitor intensity and direction of polarized light from interplanetary space–A	E. P. Ney	U. of Minnesota	
									Measure arrival direction and energies of primary cosmic gamma rays–A	C. P. Leavitt	U. of New Mexico	
									Detect gamma rays and analyze their energy spectrum–S	K. J. Frost	GSFC	
									Ultraviolet stellar and nebular spectrophotometer–A	K. L. Hallam	GSFC	
									Measurement of thermal-radiation characteristics of surfaces to determine emissivity stability of spacecraft temperature-control Coatings–E	C. B. Neel C. G. Robinson	ARC ARC	

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		Launch Date/ Silent Date	Vehicle & Launch Site	Period (Min.)	Statute Miles			Instrumentation Summary	Experiment and Discipline*	Experimenter	Affiliation	
					Perigee	Apogee						
SYNCOM C	To provide experience in using communications satellites in a 24-hour near-equitorial orbit. To flight-test a new, simple approach to satellite attitude and period control. To develop transportable ground facilities to be used in conjunction with communications satellites. To develop capability of launching satellites into 24-hour near-equatorial orbit using existing vehicles plus apogee kick techniques and to test components life at 24-hour-orbit altitude.	1964	Thrust-augmented Delta AMR		22,300 synchronous orbit		R. J. Darcey	The 24-hour communications satellite consists of a spin-stabilized active repeater in a near synchronous, low-inclination orbit. The spacecraft is in the form of a cylinder 28 inches in diameter and 15 inches high. The repeater consists of a 7,200-Mc receiver and an 1,800-Mc transmitter with an output of 2 watts. In addition, the spacecraft contains a vernier velocity control system for orientation of spin axis and adjustment of the orbit.				Weight: 70 lb. Power: Solar
TIROS I	To provide TV picture coverage whenever the R&D program is not providing sufficient picture data for operational use in real-time weather analysis.	1964	Delta AMR	97.5	400	400	R. Rados	Two vidicon cameras: two wide-angle lens; and a magnetic attitude control system.				The satellite will be placed in an orbit inclined 58° to the equator to provide TV coverage between 65° N. latitude and 65° S. latitude. Weight: 275 lb. Power: Solar
ORBITING ASTRONOMICAL OBSERVATORIES OAO-A OAO-B OAO-C	To make precise telescope observations from above the earth's atmosphere with satellites under control from the ground. The area of interest is that of the emission and absorption characteristics of the sun, stars, planets, nebulea and interplanetary, and interstellar media in the relatively unexplored infrared, ultraviolet, X-ray and gamma-ray regions of the spectrum.	1966	Atlas-Agena AMR		547 circular orbit		Robert R. Ziemer Dr. J. Kupperian	A fundamental objective of the program is to develop a basic spacecraft which will have the precise pointing capability, power, and data to handling equipment, etc. To carry a wide variety of astronomical experiments.	(OAO-A) Mapping stellar undervoltage radiation in ranges 3000-1700A, 200-1050A, 1500-1050A—A (OAO-A) Broadband photometric studies of stellar energy distribution (800-3000A)—A (OAO-B) Absolute spectrophotometry measurement (1000-4000A with2A resolution)—A (OAO-C) Inter-stellar absorption measurement (800-3000A with 0.1 resolution)—A	F. Whipple R. Davis A. Code J. Kupperian J. E. Milligan L. Spitzer	Smithsonian Astrophysical Observatory U. of Wisc. GSFC Princeton U.	Experiments for the first three observations have been selected and are scheduled as follows: OAO-A Smithsonian Astrophysical Observatory experiment; University of Wisconsin experiment. OAO-B GSFC experiment. OAO-C Princeton University experiment. The Smithsonian experiment is designed to map the sky as it looks in ultraviolet light. The Wisconsin experiment is to give

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		Launch Date/ Silent Date	Vehicle & Launch Site	Period (Min.)	Statute Miles			Instrumentation Summary	Experiment and Discipline*	Experimenter	Affiliation	
					Perigee	Apogee						
OAO-A OAO-B OAO-C (Continued)												more details about the amount and distribution of ultraviolet light in selected stars. The GSFC experiment will be designed to obtain more detailed data on selected stars, using a 36-inch telescope and a spectrophotometer. The Princeton experiment will be designed for high-resolution ultraviolet studies involving observations to determine some of the characteristics of the gas between stars. Weight: 3600 lb.
ORBITING GEOPHYSICAL OBSERVATORY OGO-B	To launch and operate an orbital spacecraft carrying experiments to make scientific geophysical measurements about the earth.	1965	Atlas-Agena B AMR		172	92,124	Wilfred E. Scull Dr. G. H. Ludwig	The spacecraft can accommodate as many as 50 experiments.	Solar cosmic rays–S Plasma, electrostatic analyzer–E Plasma, Faraday cup–E Positron search and gamma-ray spectrum–E, S Trapped radiation, scintillation detector–E Cosmic-ray isotope abundance–E Cosmic-ray spectra and fluxes–E Trapped radiation, omnidirectional counter–E Trapped radiation, electron spectrometer; and ionization chamber–E Triaxial search-coil magnetometer–E Rubidium-vapor magnetometer–E Spherical ion and electron trap–I	K. A. Anderson J. H. Wolfe H. Bridge T. L. Cline E. W. Hones, Jr. L. R. Davis F. B. McDonald G. H. Ludwig J. A. Simpson C. Y. Fan P. Meyer J. A. Van Allen L. A. Frank J. R. Winckler R. L. Arnoldy E. J. Smith R. E. Holzer J. P. Heppner R. C. Sagalyn	U. of Calif. ARC MIT GSFC Inst. Def. Anal. GSFC GSFC GSFC U. of Chicago U. of Iowa U. of Minnesota JPL UCLA GSFC AFCRL	To be placed in a highly eccentric 31° orbit. Weight: 1000 lb.

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		Launch Date/ Silent Date	Vehicle & Launch Site	Period (Min.)	Statute Miles			Instrumentation Summary	Experiment and Discipline*	Experimenter	Affiliation	
					Perigee	Apogee						
OGO-B (Continued)									Planar ion and electron trap–I	E. C. Whipple	GSFC	
									Radio propagation–I	R. S. Lawrence	NBS	
									Atmospheric mass spectrum–R	H. A. Taylor, Jr.	GSFC	
									Interplanetary dust particles–P	W. M. Alexander	GSFC	
									VLF noise and propagation–I	R. A. Helliwell	Stanford U.	
									Radio astronomy–A	F. T. Haddock	U. of Michigan	
									Geocoronal Lyman-Alpha scattering–P	P. W. Mange	NRL	
									Gegenschein photometry–P	C. L. Wolff K. Hallam	GSFC	
ORBITING GEOPHYSICAL OBSERVATORY OGO-C	To launch and operate an orbital spacecraft carrying experiments to make scientific geophysical measurements about the earth, from a low-altitude polar orbit of low eccentricity.	1965	Thrust-augmented Thor-Agena D PMR		161	575	Wilfred E. Scull N. W. Spencer	The spacecraft can accommodate as many as 50 experiments.	Radio astronomy–A	F. T. Haddock	U. of Michigan	Weight: 1000 lb.
									VLF measurements–I	R. A. Helliwell	Stanford U.	
									VLF measurements–I	M. G. Morgan T. Laaspere	Dartmouth College	
									Triaxial search-coil magnetometer–E	R. E. Holzer E. J. Smith	UCLA JPL	
									Rubidium-vapor magnetometer–E	J. P. Heppner	GSFC	
									Cosmic-ray and polar-region ionization study–E	H. V. Neher H. R. Anderson	Calif. Inst. Tech. JPL	
									Energetic particles survey–E	J. A. Simpson	U. of Chicago	
									Galactic and solar-cosmic rays–E	W. R. Webber	U. of Minnesota	
									Corpuscular radiation in auroral and polar zones–E	J. A. Van Allen	U. of Iowa	
									Trapped-radiation scintillation detector–E	R. A. Hoffman	GSFC	
									Air-glow study–R	J. Blamont	Univ. of Paris	
									Lyman-alpha and air-glow study–R	P. W. Mange	NRL	
									Air-glow study, undervoltage spectrometer–R	C. A. Barth L. Wallace	JPL Kitt Peak Nat. Obs.	

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I – Ionospheric Physics
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P – Planetary Atmospheres
S – Solar Physics

Designation	Objectives	LAUNCH AND ORBIT DATA					Project Manager and Project Scientist	EXPERIMENT DATA				Remarks
		Launch Date/ Silent Date	Vehicle & Launch Site	Period (Min.)	Statute Miles			Instrumentation Summary	Experiment and Discipline*	Experimenter	Affiliation	
					Perigee	Apogee						
OGO-C (Continued)									Neutral particles and ion-composition study–R	E. J. Schaefer	U. of Michigan	
									Positive ion study–R	H. A. Taylor, Jr.	GSFC	
									Neutral particle study–R	G. P. Newton	GSFC	
									Micrometeorites–P	W. M. Alexander	GSFC	
									Ionospheric composition and undervoltage flux–I	R. E. Bourdeau	GSFC	
									Undervoltage spectrometer–S	H. E. Hinteregger	AFCRL	
									Solar X-rays–S	R. W. Kreplin	NRL	
ORBITING SOLAR OBSERVATORY OSO-C	To conduct experiments in solar physics above the earth's atmosphere; experiments will detect and measure electromagnetic radiation from the sun and determine their energy level.	1965	Delta AMR	95 ± 2	345 ± 34 circular orbit		Laurence T. Hogarth Dr. John C. Lindsay	Stabilized platform for solar-oriented scientific instruments. Experiments not requiring fixed orientation with respect to the sun are housed in the spinning-wheel section of the satellite. Electrical power is supplied by an array of solar cells mounted on the stabilized section. A complete telemetry system is provided to transmit information back to earth. Spacecraft has pointing capability similar to OSO-I.	POINTED Ultraviolet monochromator–S	H. E. Hinteregger	Air Force Cambridge Research Lab.	Weight: 590 lb. (320 for spacecraft and 270 for experiments) Power: Solar Inclination: 33°
									Solar spectrometer–S	W. M. Neupert	GSFC	
									WHEEL Earth's albedo in ultraviolet and visible regions–S	C. B. Neel	ARC	
									Emissivity stability of low-temperature coatings–E	C. B. Neel	ARC	
									Gamma-ray astronomy–A	W. L. Kraushaar	MIT	
									Solar X-ray–S	R. Teske	U. of Michigan	
									Solar gamma rays–S	E. M. Hofner	U. of Rochester	
									X-ray and gamma-ray astronomy–S	L. E. Peterson	U. of Calif.	
ORBITING SOLAR OBSERVATORY OSO-D	To conduct experiments in solar physics above the earth's atmosphere; experiments will detect and measure electromagnetic radiation from the sun and determine their energy level.	1966	Delta AMR	95 ± 2	345 ± 34 circular orbit		Laurence T. Hogarth Dr. John C. Lindsay	Stabilized platform for solar-oriented scientific instruments. Experiments not requiring fixed orientation with respect to the sun are housed in the spinning-wheel section of the satellite. Electrical power is supplied by an array of solar cells mounted on the stabilized section. A complete telemetry system is provided to transmit information back to earth. Spacecraft has pointing and scanning capability similar to OSO-B.	POINTED Solar X-ray telescope–S	R. Giacconi	American Science and Engineering, Inc.	Weight: 600 lb. (330 for spacecraft and 270 for experiments) Power: Solar Inclination: 33°
									Bragg crystal X-ray spectrometer–S	T. A. Chubb R. W. Kreplin	NRL	
									Improved normal incidence 300- to 1300A scanning spectroheliograph–S	L. Goldberg	Harvard U. Observatory	
									WHEEL Measure extra solar X-radiation–A	R. Giacconi	American Science and Engineering, Inc.	

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PART II
SCHEDULED SATELLITE PROJECTS (Cont.)
PARTIAL LISTING

Designation	Objectives	LAUNCH AND ORBIT DATA					Project Manager and Project Scientist	EXPERIMENT DATA				Remarks
		Launch Date/ Silent Date	Vehicle & Launch Site	Period (Min.)	Statute Miles			Instrumentation Summary	Experiment and Discipline*	Experimenter	Affiliation	
					Perigee	Apogee						
OSO-D (Continued)									Distribution of total solar X-ray emission over a wide band–S	R. L. F. Boyd E. A. Stewardson	Leicester U. U. College, London	
									Study of solar He II resonance emission–S	R. L. F. Boyd E. A. Stewardson	U. College, London	
									Proton-electron detector–E	J. Waggoner	U. of Calif. Laurence Radiation Lab.	
									X-ray ion chamber monitoring–S	T. A. Chubb	NRL	
									Lyman-alpha night-sky glow–A	T. A. Chubb	NRL	
ORBITING SOLAR OBSERVATORY OSO-E	To conduct experiments in solar physics above the earth's atmosphere; experiments will detect and measure electromagnetic radiation from the sun, and determine their energy levels.	1967	Delta AMR	95 ± 2	345 ± 34 circular orbit		Laurence T. Hogarth Dr. John C. Lindsay	Stabilized platform for solar-oriented scientific instruments. Experiments not requiring fixed orientation with respect to the sun are housed in the spinning-wheel section of the satellite. Electrical power is supplied by an array of solar cells mounted on the stabilized section. A complete telemetry system is provided to transmit information back to earth. Spacecraft has pointing and scanning capability similar to OSO-B.	POINTED X-ray spectroheliograph–S	R. L. F. Boyd E. A. Stewardson P. J. Brown	U. College, London U. of Leicester	Weight: Estimated 590 lb. (330 for spacecraft and 260 for experiments) Power: Solar Inclination: 33°
									Extreme ultraviolet solar spectroheliograph–S	R. Tousey J. D. Purcell H. Friedman	NRL	
									Continuation of the studies of solar spectrum–S	J. C. Lindsay W. Neupert	GSFC	
									WHEEL Measurement of solar reversal of the solar Lyman-alpha line–S	J. E. Blamont	U. of Paris	
									Solar X-ray radiation ion-chamber photometer, monitoring experiments–S	R. W. Kreplin	NRL	
									Low-energy gamma-ray region–S	K. J. Frost	GSFC	
									Dim-light monitoring experiment, measuring intensity and polarization of the light from the air-glow layer–A	E. P. Ney	U. of Minnesota	
									Solar for ultraviolet radiation monitoring in three euv bands–S	W. A. Rense	U. of Colo.	
TIROS J	To contribute to the development of a synchronous orbit meteorological satellite system.		Delta AMR	154.8	360	3600	R. Rados	Two vidicon camera systems; a digitized MRIR system; and a magnetic attitude control system.				The mission of this spacecraft is to contribute to the development of the capability of providing continuous

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PART II
SCHEDULED SATELLITE PROJECTS (Cont.)
PARTIAL LISTING

Designation	Objectives	LAUNCH AND ORBIT DATA					Project Manager and Project Scientist	EXPERIMENT DATA				Remarks
		Launch Date/ Silent Date	Vehicle & Launch Site	Period (Min.)	Statute Miles			Instrumentation Summary	Experiment and Discipline*	Experimenter	Affiliation	
					Perigee	Apogee						
TIROS J (Continued)												observations of the earth's atmospheric phenomena. Weight: 300 lb. 33° prograde Power: Solar
TIROS OT-1	To launch into orbit a spacecraft that will contribute to the development of a global meteorological observation system.		Delta AMR	97.5	400	400	R. Rados	The satellite will contain two standard TIROS cameras with recorders, two IR horizon sensors for attitude determination, and a magnetic attitude control system. Horizon sensors will be used with an onboard spacecraft computer to provide camera shutter at spacecraft local vertical. Magnetic spin-control and spacecraft digital clock to be used.				This mission will endeavor to increase the area of meteorological observation, to improve the accuracy of TV picture location, and to eliminate attitude constraints through the use of a cartwheel-configured satellite in a nearly sun-synchronous (82° retrograde) polar orbit. This configuration will permit the cameras to view the earth and its cloud cover at zenith and will be limited in coverage only by the sun's coverage of the earth and the limitations of the satellite's power system. Weight: 305 lb. Power: Solar 58.3° prograde

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NOTES

1. Numbering System: NASA 4. AEROBEE 150, 150A 10. NIKE CAJUN
6. AEROBEE 300 11. ARGO D-8
8. ARGO D-4

NASA 12. SPECIAL PROJECTS 16. ASTROBEE 1500
14. NIKE APACHE 17. AEROBEE 350

NASA 1. AEROBEE 100, 2. ARCON, 3. NIKE ASP, 5. IRIS, 7. ARGO E-5, 9. SKYLARK, and 15. ARCAS, are not listed for use on this schedule.

2. Identifying letters: The letters which follow each rocket number identify
(1) the instrumenting agency, and
(2) the experiment according to the following list:

AGENCY

G – Goddard
N – Other NASA Centers
U – College or University
D – DOD
A – Other Government Agency
C – Industrial Corporations
I – International

EXPERIMENT

A – Aeronomy
E – Energetic Particles and Fields
I – Ionospheric Physics
S – Solar Physics
G – Galactic Astronomy
R – Radio Astronomy
B – Biological
P – Special Projects
T – Test and Support

FIRING SITES

ASC Ascension Island
AUS Australia
EGL Eglin
FC Fort Churchill
IND India
NOR Norway
PAK Pakistan
PMR Pacific Missile Range
Pt. A Point Arguello
SWE Sweden
WI Wallops Island

PART III

NASA SOUNDING ROCKET FLIGHTS

NASA NO.	FIRING			PRINCIPAL NASA SCIENTIST / COOPERATING INVESTIGATOR	EXPERIMENT	RESULTS*
	DATE	SITE	PERF*			
				AERONOMY		
	1960					
4.09 GA	April 29	WI	S	Horowitz	Atm. Comp.	S
10.03 GA	June 16	WI	P	Nordberg	Grenade	X
10.04 GA	July 9	WI	S	Nordberg	Grenade	S
10.01 GA	14	WI	S	Nordberg	Grenade	X
4.14 GA	Nov. 15	WI	S	Taylor	Atmos. Comp.	S
10.06 GA	Dec. 14	WI	S	Nordberg	Grenade	S
	1961					
10.07 GA	Feb. 14	WI	S	Nordberg	Grenade	S
10.08 GA	17	WI	P	Nordberg	Grenade	S
10.33 GA	April 5	WI	S	Nordberg	Grenade	P
10.34 GA	27	WI	X	Smith	Grenade	X
10.02 GA	May 5	WI	S	Smith	Grenade	S
10.28 GA	6	WI	S	Smith	Grenade	S
10.29 GA	9	WI	S	Smith	Grenade	P
10.30 GA	July 13	WI	S	Smith	Grenade	S
10.31 GA	14	WI	S	Smith	Grenade	S
10.32 GA	20	WI	S	Smith	Grenade	S
10.35 GA	21	WI	S	Smith	Grenade	X
10.36 GA	Sep. 16	WI	P	Smith	Grenade	P
10.37 GA	17	WI	S	Smith	Grenade	X
1.08 GA	23	FC	S	Varian-Martin	Atm. Structure	S
1.09 GA	30	FC	S	Varian-Martin	Atm. Structure	S
8.23 GA	Oct. 10	WI	S	Taylor	Ionosphere	S
1.10 GA	15	FC	S	Varian-Martin	Atm. Structure	S
1.07 GA	17	FC	S	Varian-Martin	Atm. Structure	S
1.11 GA	Nov. 1	FC	S	Varian-Martin	Atm. Structure	S
1.12 GA	5	FC	S	Varian-Martin	Atm. Structure	S
10.64 GA	Dec. 21	WI	S	U/M-Spencer	Atm. Structure	S
	1962					
10.38 GA	Mar. 2	WI	S	Smith	Grenade	S
10.39 GA	2	WI	S	Smith	Grenade	S
4.18 GA	19	WI	X	U/M-Spencer	Atm. Structure	X
10.40 GA	23	WI	S	Smith	Grenade	S
10.41 GA	28	WI	S	Smith	Grenade	S
10.42 GA	April 17	WI	S	Smith	Grenade	S
5.04 GA	May 3	WI	P	Taylor	Atm. Structure	S

*S–Successful
P–Partial Success
X–Unsuccessful
} - - Subject to Interpretation

PART III
NASA SOUNDING ROCKET FLIGHTS (Cont.)

NASA NO.	FIRING			PRINCIPAL NASA SCIENTIST / COOPERATING INVESTIGATOR	EXPERIMENT	RESULTS*
	DATE	SITE	PERF*			
10.43 GA	June 7	WI	S	Smith	Grenade	S
10.44 GA	8	WI	S	Smith	Grenade	S
10.65 GA	Nov. 16	FC	X	Smith	Grenade	X
6.06 GA	20	WI	S	Brace	Thermosph. Probe	S
10.45 GA	Dec. 1	WI	S	Smith	Grenade	S
10.68 GA	1	FC	S	Smith	Grenade	X
10.46 GA	4	WI	S	Smith	Grenade	X
10.67 GA	4	FC	X	Smith	Grenade	S
10.47 GA	6	WI	S	Smith	Grenade	S
10.66 GA	6	FC	S	Smith	Grenade	S
	1963					
10.48 GA	Feb. 20	WI	S	Smith	Grenade	S
10.58 GA	20	FC	S	Smith	Grenade	S
10.53 GA	28	WI	S	Smith	Grenade	S
10.59 GA	28	FC	S	Smith	Grenade	S
10.54 GA	Mar. 9	WI	S	Smith	Grenade	S
10.60 GA	9	FC	S	Smith	Grenade	S
6.07 GA	April 18	WI	S	Brace	Thermosph. Probe	S
10.55 GA	Dec. 7	WI	S	Smith	Grenade	S
	1964					
10.61 GA	Jan. 24	WI	S	Smith	Grenade	S
10.86 GA	24	FC	X	Smith	Grenade	X
6.09 GA	29	WI	S	Brace	Thermosph. Probe	S
10.71 GA	29	WI	S	Smith	Grenade	S
10.89 GA	29	FC	S	Smith	Grenade	S
10.81 GA	29	ASC	S	Smith	Grenade	S
10.62 GA	Feb. 4	WI	S	Smith	Grenade	S
10.87 GA	5	FC	S	Smith	Grenade	S
10.63 GA	5	WI	S	Smith	Grenade	S
10.136 GA	13	WI	S	Smith	Grenade	S
10.88 GA	13	FC	S	Smith	Grenade	S
	1961					
10.72 NA	Nov. 18	WI	S	LRC/Hord	Airglow	S
	1962					
10.79 NA	April 5	WI	S	LRC/Potter	Ozone	S
1.13 NA	Sep. 6	WI	S	JPL/Barth	U. V. Airglow	S
1.14 NA	Nov. 20	WI	X	JPL/Barth	U. V. Airglow	X
	1963					
10.80 NA	Jan. 17	WI	S	LRC/Potter	Ozone	S
10.92 NA	Sep. 25	WI	S	LRC	Chemical Release	S
10.93 NA	Sep. 25	WI	S	LRC	Chemical Release	S
14.102 NA	Oct. 9	WI	S	LRC/Potter	Chemical Release	S
14.103 NA	Oct. 10	WI	S	LRC/Potter	Chemical Release	S
4.85 NA	Nov. 12	WI	S	JPL/Barth	Airglow	S
	1960					
10.09 UA	Nov. 2	WI	S	U/M-Dubin	Atm. Comp.	X
10.10 UA	16	WI	S	U/M-Dubin	Atm. Comp.	X

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PART III

NASA SOUNDING ROCKET FLIGHTS (Cont.)

NASA NO.	FIRING			PRINCIPAL NASA SCIENTIST / COOPERATING INVESTIGATOR	EXPERIMENT	RESULTS*
	DATE	SITE	PERF*			
	1961					
10.50 UA	June 6	WI	S	U/M-Dubin	Atm. Structure	S
10.56 UA	9	WI	S	U/M-Dubin	Atm. Comp.	X
10.57 UA	July 26	WI	S	U/M-Dubin	Atm. Comp.	X
	1962					
10.90 UA	Feb. 20	WI	S	U/M-Dubin	Atm. Comp.	X
10.91 UA	May 18	WI	S	U/M-Dubin	Atm. Comp.	S
14.19 UA	June 6	WI	S	U/M-Spencer	Atm. Structure	S
14.20 UA	Dec. 1	WI	S	U/M-Spencer	Atm. Structure	S
4.74 UA	13	WI	X	JHU/Dubin	Airglow	X
	1963					
4.73 UA	Jan. 29	WI	X	JHU/Dubin	Airglow	X
14.08 UA	Mar. 28	WI	S	U/M-Dubin	Atm. Comp.	S
14.09 UA	28	WI	S	U/M-Dubin	Atm. Comp	X
4.98 UA	May 7	WI	S	JHU/Dubin	Airglow	S
4.75 UA	July 20	FC	X	JHU/Dubin	Airglow	X
10.75 UA	Aug. 2	WI	S	U/M-Holtz	Atm. Density	S
4.76 UA	Nov. 12	WI	S	JHU/Dubin	Airglow	S
14.10 UA	26	WI	S	U/M-Dubin	Atm. Comp.	S
10.131 UA	26	WI	S	U/M-Dubin	Atm. Density	S
14.21 UA	Dec. 7	WI	S	U/M-W. Smith	Atm. Structure	S
	1964					
14.22 UA	Feb. 4	ASC	S	U/M-W. Smith	Atm. Structure	S
	1963					
14.140 DA	May 18	EGL	S	AFCRL/Ga. Tech.	Sodium Vapor	S
14.141 DA	18	EGL	S	AFCRL/Ga. Tech.	Sodium Vapor	S
10.130 DA	22	EGL	S	AFCRL/Ga. Tech.	Sodium Vapor	S
	1964					
8.31 DA	Jan. 17	WI	S	NRL/Dubin	Comp.-Airglow	S
	1962					
14.45 AA	Dec. 1	EGL	S	AFCRL/Dubin	Sodium Vapor	X
14.46 AA	3	EGL	S	AFCRL/Dubin	Sodium Vapor	P
	1959					
3.13 CA	Aug. 17	WI	S	GCA/Dubin	Sodium Vapor	S
3.14 CA	19	WI	X	GCA/Dubin	Sodium Vapor	X
3.15 CA	Nov. 18	WI	S	GCA/Dubin	Sodium Vapor	S
3.16 CA	19	WI	S	GCA/Dubin	Sodium Vapor	X
3.17 CA	20	WI	S	GCA/Dubin	Sodium Vapor	X
	1960					
3.23 CA	May 24	WI	X	GCA/Dubin	Sodium Vapor	X
3.24 CA	25	WI	S	GCA/Dubin	Sodium Vapor	S
10.05 CA	Sep. 20	WI	S	Nordberg	Grenade	X
8.04 CA	Nov. 10	WI	S	Lockheed/Dubin	Ionosphere	P
10.11 CA	Dec. 9	WI	X	GCA/Dubin	Sodium Vapor	X
10.12 CA	9	WI	S	GCA/Dubin	Sodium Vapor	S
8.05 CA	Dec. 10	WI	S	GCA/Dubin	Sodium Vapor	S

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PART III
NASA SOUNDING ROCKET FLIGHTS (Cont.)

NASA NO.	FIRING			PRINCIPAL NASA SCIENTIST / COOPERATING INVESTIGATOR	EXPERIMENT	RESULTS*
	DATE	SITE	PERF*			
	1961					
3.05 CA	April 19	WI	S	GCA/Dubin	Sodium Vapor	S
3.06 CA	21	WI	S	GCA/Dubin	Sodium Vapor	S
3.07 CA	21	WI	X	GCA/Dubin	Sodium Vapor	X
3.08 CA	21	WI	S	GCA/Dubin	Sodium Vapor	S
8.06 CA	Sep. 13	WI	S	GCA/Smith	Sodium Vapor	S
8.22 CA	13	WI	S	GCA/Smith	Sodium Vapor	S
3.09 CA	16	WI	X	GCA/Smith	Sodium Vapor	X
3.18 CA	16	WI	S	GCA/Smith	Sodium Vapor	S
3.19 CA	17	WI	S	GCA/Smith	Sodium Vapor	S
	1962					
10.100 CA	Mar. 1	WI	S	GCA/Smith	Sodium Vapor	S
10.101 CA	2	WI	S	GCA/Smith	Sodium Vapor	S
10.102 CA	23	WI	S	GCA/Smith	Sodium Vapor	S
10.103 CA	27	WI	S	GCA/Smith	Sodium Vapor	S
3.20 CA	April 17	WI	S	GCA/Smith	Sodium Vapor	S
3.21 CA	June 7	WI	S	GCA/Smith	Sodium Vapor	S
3.22 CA	7	WI	X	GCA/Smith	Sodium Vapor	X
14.30 CA	Aug. 23	WI	P	Lockheed/Depew	Atm. Structure	X
14.16 CA	Nov. 7	WI	S	GCA/Smith	Sodium Vapor	S
14.17 CA	Nov. 30	WI	S	GCA/Smith	Sodium Vapor	S
14.18 CA	Dec. 5	WI	S	GCA/Smith	Sodium Vapor	P
	1963					
3.11 CA	Feb. 18	WI	X	GCA/Smith	Sodium Vapor	X
14.35 CA	20	WI	S	GCA/Smith	Sodium Vapor	S
14.39 CA	21	WI	S	GCA/Smith	Sodium Vapor	S
14.110 CA	May 8	WI	S	Lockheed/Bourdeau	Massenfilter	X
14.13 CA	22	FC	S	GCA/Dubin	Sodium Vapor	S
14.14 CA	22	FC	S	GCA/Dubin	Sodium Vapor	S
14.15 CA	23	FC	S	GCA/Dubin	Sodium Vapor	S
14.40 CA	24	WI	S	GCA/Dubin	Sodium Vapor	S
14.41 CA	24	WI	S	GCA/Dubin	Sodium Vapor	X
14.42 CA	25	WI	S	GCA/Dubin	Sodium Vapor	S
	1964					
14.38 CA	Jan. 15	WI	X	GCA/Smith	Sodium Vapor	X
14.106 CA	15	WI	P	GCA/Smith	Sodium Vapor	S
14.125 CA	16	WI	S	GCA/Smith	Sodium Vapor	S
14.126 CA	16	WI	S	GCA/Smith	Sodium Vapor	S
	1962					
Rehbar 1**	June 7	PAK	S	Mustafa	Sodium Vapor	X
Rehbar 2**	11	PAK	S	Mustafa	Sodium Vapor	X
	1963					
10.77 IA	May 16	PAK	S	Pakistan	Sodium Vapor	X
14.137 IA	20	Italy	S	Italy	Sodium Vapor	S
14.138 IA	21	Italy	S	Italy	Sodium Vapor	S
14.139 IA	21	Italy	S	Italy	Sodium Vapor	S
14.128 IA	Nov. 21	IND	S	India/Dubin	Sodium Vapor	P

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NASA SOUNDING ROCKET FLIGHTS (Cont.)

NASA NO.	FIRING			PRINCIPAL NASA SCIENTIST / COOPERATING INVESTIGATOR	EXPERIMENT	RESULTS*
	DATE	SITE	PERF*			
	1964					
14.129 IA	Jan. 8	IND	S	India/Dubin	Sodium Vapor	S
14.130 IA	12	IND	S	India/Dubin	Sodium Vapor	S
				ENERGETIC PARTICLES AND FIELDS		
	1960					
10.17 GE	June 6	FC	S	Fichtel	SBE	S
8.07 GE	30	WI	X	Heppner	Magnetic Field	S
10.18 GE	July 22	FC	X	Fichtel	SBE	S
10.19 GE	Sep. 3	FC	S	Fichtel	SBE	S
10.20 GE	3	FC	S	Fichtel	SBE	S
11.01 GE	19	PMR	S	Naugle	NERV 1	S
10.21 GE	27	FC	S	Fichtel	SBE	S
10.22 GE	Nov. 11	FC	S	Fichtel	SBE	S
10.23 GE	11	FC	S	Fichtel	SBE	P
10.24 GE	12	FC	S	Fichtel	SBE	S
10.15 GE	12	FC	S	Fichtel	SBE	S
10.16 GE	13	FC	S	Fichtel	SBE	S
10.13 GE	16	FC	S	Fichtel	SBE	S
10.14 GE	17	FC	S	Fichtel	SBE	S
10.26 GE	18	FC	S	Fichtel	SBE	S
10.27 GE	18	FC	S	Fichtel	SBE	S
8.08 GE	Dec. 12	WI	S	Heppner	Magnetic Fields	S
	1961					
10.76 GE	Dec. 10	FC	S	Ogilvie-Fichtel	Cosmic Ray	S
	1963					
4.91 GE	Sep. 4	FC	S	Fichtel	Heavy Cosmic Rays	S
	1964					
14.43 GE	Feb. 20	FC	S	Evans	Aurora	P
	1960					
4.16 UE	Aug. 23	WI	S	NYU/Meredith	Cosmic Ray	S
	1961					
14.03 UE	July 14	WI	S	UNH/Heppner	Magnetic Field	S
14.04 UE	14	WI	S	UNH/Heppner	Magnetic Field	S
14.05 UE	20	WI	S	UNH/Heppner	Magnetic Field	S
	1963					
11.06 UE	Feb. 12	PMR	S	U. Minn./Cline	Electron Spect.	S
14.06 UE	Sep. 9	WI	S	UNH/Schardt	Electrojet	S
	1964					
14.150 UE	Jan. 15	WI	P	Rice/Schardt	Sodium Vapor	X
14.79 UE	25	IND	S	UNH/Schardt	Equitorial Electrojet	S
14.180 UE	27	IND	S	UNH/Schardt	Equitorial Electrojet	S
14.81 UE	29	IND	S	UNH/Schardt	Equitorial Electrojet	S
14.82 UE	31	IND	S	UNH/Schardt	Equitorial Electrojet	S

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PART

NASA SOUNDING ROCKET FLIGHTS (Cont.)

NASA NO.	FIRING			PRINCIPAL NASA SCIENTIST / COOPERATING INVESTIGATOR	EXPERIMENT	RESULTS*
	DATE	SITE	PERF*			
				IONOSPHERIC PHYSICS		
	1959					
4.08 GI	Sep. 11	FC	S	Jackson	Ionosphere	S
4.07 GI	14	FC	S	Jackson	Ionosphere	S
	1960					
1.01 GI	Nov. 23	FC	S	Whipple	Ionosphere	S
1.02 GI	27	FC	S	Whipple	Ionosphere	S
	1961					
8.10 GI	April 27	WI	S	Jackson	Ionosphere	P
8.09 GI	June 13	WI	S	Jackson	Ionosphere	P
10.74 GI	Dec. 21	WI	S	Kane	Ionosphere	S
	1962					
10.110 GI	April 26	WI	S	Serbu	Electron Temp	S
8.21 GI	May 3	WI	S	Serbu	ELF Electron Trap	S
10.112 GI	16	WI	S	Serbu	Electron Temp	S
10.111 GI	17	WI	S	Serbu	Electron Temp	S
14.12 GI	June 15	WI	S	Kane	Ionosphere	S
K63-1**	July 27	SWE	S	Martin-Läf/Witt	Grenade	S
K63-2**	29	SWE	S	Martin-Läf/Witt	Grenade	S
K63-3**	Aug. 1	SWE	S	Martin-Läf/Witt	Grenade	S
K63-4**	7	SWE	S	Fichtel	Heavy Cosmic Rays	S
K62-1**	7	SWE	S	Ortner/Witt	Air Sample	S
K62-3**	11	SWE	S	Ortner/Witt	Air Sample	S
K62-4**	11	SWE	S	Ortner/Witt	Air Sample	P
K62-5**	31	SWE	S	Ortner/Witt	Air Sample	X
14.31 GI	Oct. 16	WI	S	Bauer	Ionosphere	S
14.32 GI	Dec. 1	WI	S	Bauer	Ionosphere	S
	1963					
14.107 GI	Mar. 8	WI	S	Whipple	Ionosphere	P
14.108 GI	April 9	WI	S	Kane	D-Region	S
4.44 GI	23	WI	S	Bauer	Elec. Density	S
8.14 GI	July 2	WI	S	Bauer	Ionosphere	S
6.08 GI	20	WI	S	Brace	Thermosphere Probe	S
4.65 GI	Sep. 25	WI	S	Serbu/Hirao	Ionosphere	S
4.64 GI	28	WI	S	Serbu/Hirao	Ionosphere	S
8.18 GI	29	WI	S	Bauer	Ionosphere	
14.37 GI	Dec. 13	WI	P	Whipple	Ionosphere	
	1960					
6.01 UI	Mar. 16	FC	S	U/M Bourdeau	Ionosphere	S
3.10 UI	16	FC	X	U/M Bourdeau	Ionosphere	X
6.02 UI	June 15	FC	S	U/M Bourdeau	Ionosphere	S
6.03 UI	Aug. 3	WI	S	U/M Bourdeau	Ionosphere	S
	1961					
6.04 UI	Mar. 26	WI	S	U/M Bourdeau	Ionosphere	S
6.05 UI	Dec. 22	WI	S	U/M Wright	Ionosphere	S
	1963					
4.58 UI	April 3	WI	S	Stanford/Bourdeau	Ionosphere	S
6.03 UI	July 10	WI	S	Stanford/Bourdeau	Ionosphere	S

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NASA SOUNDING ROCKET FLIGHTS (Cont.)

NASA NO.	FIRING			PRINCIPAL NASA SCIENTIST / COOPERATING INVESTIGATOR	EXPERIMENT	RESULTS*
	DATE	SITE	PERF*			
	1963					
14.36 DI	Oct. 7	FC	S	BRL/Bourdeau	Ionosphere	P
	1961					
8.15 AI	June 24	WI	S	CRPL/AIL-Jackson	Ionosphere	S
8.17 AI	Oct. 14	WI	S	Jackson	Ionosphere	S
	1962					
8.16 AI	Feb. 7	WI	S	Jackson	Ionosphere	X
	1960					
3.12 CI	Aug. 22	WI	X	GCA/Bourdeau	Langmuir Probe	X
10.25 CI	Dec. 8	WI	S	GCA/Bourdeau	Langmuir Probe	S
	1961					
10.51 CI	July 18	WI	S	GCA/Wright	Langmuir Probe	S
10.52 CI	Oct. 27	WI	S	GCA/Bourdeau	Langmuir Probe	S
	1962					
10.99 CI	Nov. 7	WI	S	GCA/Bourdeau	Ionosphere	S
10.108 CI	30	WI	S	GCA/Bourdeau	Ionosphere	S
10.109 CI	Dec. 5	WI	S	GCA/Bourdeau	Ionosphere	S
	1963					
14.86 CI	Feb. 27	WI	S	GCA/Bourdeau	Ionosphere	S
14.87 CI	Mar. 28	WI	P	GCA/Bourdeau	Ionosphere	S
14.88 CI	July 14	FC	P	GCA/Bourdeau	Ionosphere	P
14.89 CI	20	FC	X	GCA/Bourdeau	Eclipse Ionosphere	X
14.90 CI	20	FC	X	GCA/Bourdeau	Eclipse Ionosphere	X
14.91 CI	20	FC	S	GCA/Bourdeau	Eclipse Ionosphere	S
14.92 CI	20	FC	S	GCA/Bourdeau	Eclipse Ionosphere	S
14.93 CI	20	FC	S	GCA/Bourdeau	Eclipse Ionosphere	S
14.94 CI	20	FC	S	GCA/Bourdeau	Eclipse Ionosphere	S
	1959					
4.02 II	Sep. 17	FC	S	DRTE-Jackson	Ionosphere	S
4.03 II	20	FC	P	DRTE-Jackson	Ionosphere	X
	1961					
8.13 II	June 15	WI	S	DRTE-Jackson	Antenna Test	S
	1962					
4.79 II	Nov. 16	WI	X	AUS/Cartwright	Ionosphere	X
4.80 II	Dec. 11	WI	X	AUS/Cartwright	Ionosphere	X
Ferdinand III	11	NOR	S	Kane	Ionosphere	S
Ferdinand II	14	NOR	S	Norway	NASA T/M only	S
	1963					
4.96 II	Mar. 12	WI	S	AUS/Cartwright	VLF	S
4.97 II	May 9	WI	S	AUS/Cartwright	VLF	S
Ferdinand V	Aug. 8	NOR	S	Kane	Ionosphere	X
Ferdinand IV	11	NOR	S	Kane	Ionosphere	S
4.93 II	Oct. 17	WI	S	France/Shea	Ionosphere	S
4.94 II	31	WI	S	France/Shea	Ionosphere	S

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PART III
NASA SOUNDING ROCKET FLIGHTS (Cont.)

NASA NO.	FIRING			PRINCIPAL NASA SCIENTIST / COOPERATING INVESTIGATOR	EXPERIMENT	RESULTS*
	DATE	SITE	PERF*			
				SOLAR PHYSICS		
	1960					
3.01 GS	Mar. 1	WI	S	Hallam	Solar Study	X
3.02 GS	3	WI	S	Hallam	Solar Study	X
3.03 GS	April 27	WI	X	Hallam	Solar Study	X
3.04 GS	May 25	WI	X	Hallam	Solar Study	X
	1961					
4.25 GS	Sep. 30	WI	S	Behring	Solar Studies	S
	1963					
4.77 GS	July 20	WI	S	Hallam-Wolff	Solar Studies	X
4.78 GS	Oct. 1	WI	S	Hallam	Solar Studies	P
4.33 GS	15	WI	S	Money	Solar Studies	S
	1962					
4.23 US	June 24	WI	S	U. Colo./Lindsay	Sunfollower	P
4.21 US	Oct. 27	WI	S	Harvard/Lindsay	Solar	X
	1963					
4.22 US	Sep. 6	WI	S	Harvard/Lindsay	Solar Studies	S
	1963					
4.61 AS	June 20	WI	S	NRL/Packer	Coronograph	P
4.62 AS	28	WI	S	NRL/Packer	Coronograph	P
				GALACTIC ASTRONOMY		
	1960					
4.04 GG	April 27	WI	P	Kupperian	Stellar Fluxes	P
4.05 GG	May 27	WI	S	Boggess	Stellar Fluxes	P
4.06 GG	June 24	WI	S	Boggess	Stellar Fluxes	S
4.11 GG	Nov. 22	WI	S	Stecher	Stellar Spectra	S
	1961					
4.34 GG	Mar. 31	WI	P	Boggess	Stellar Fluxes	P
9.01 GG	Sep. 18	AUS	S	Boggess	Stellar Photo	S
9.02 GG	Oct. 4	AUS	S	Boggess	Stellar Photo	S
9.03 GG	Nov. 1	AUS	S	Boggess	Stellar Photo	P
9.04 GG	20	AUS	S	Boggess	Stellar Photo	S
	1962					
4.35 GG	Feb. 7	WI	X	Stecher	Stellar Spectra	X
4.36 GG	Sep. 22	WI	S	Stecher	Stellar Photo	S
	1963					
4.30 GG	Mar. 28	WI	S	Boggess	Stellar Spectra	S
4.37 GG	July 19	WI	S	Stecher	Stellar Spectra	S
4.29 GG	23	WI	S	Stecher	Stellar Spectra	S
4.31 GG	Oct. 10	WI	X	Boggess	Stellar Spectra	X
	1962					
4.54 UG	Sep. 30	WI	S	U. of Wisc./Kupperian	Stellar Studies	S

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NASA SOUNDING ROCKET FLIGHTS (Cont.)

NASA NO.	FIRING			PRINCIPAL NASA SCIENTIST / COOPERATING INVESTIGATOR	EXPERIMENT	RESULTS*
	DATE	SITE	PERF*			
	1962					
4.69 CG	Sep. 30	WI	S	Lockheed/Dubin	Night Sky Mapping	S
	1963					
4.70 CG	Mar. 16	WI	S	Lockheed/Depew	Stellar Spectra	S
				RADIO AND ASTRONOMY		
	1962					
11.02 UR	Sep. 22	WI	S	U. of Mich./Haddock	Radio Astronomy	S
				BIOLOGICAL		
	1961					
11.04 GB	Nov. 15	Pt. A	S	Campbell	BIOS 1	X
11.05 GB	18	Pt. A	P	Campbell	BIOS 1	X
				SPECIAL PROJECTS		
	1960					
1.03 GP	Sep. 15	FC	S	Baumann	AMPP	S
1.05 GP	24	FC	S	Baumann	AMPP	P
4.43 GP	Oct. 5	FC	S	NRL-Baumann	AMPP	S
	1961					
1.04 GP	May 17	FC	S	Baumann	AMPP	P
1.06 GP	19	FC	S	Baumann	AMPP	S
	1961					
4.38 NP	Feb. 5	WI	S	LRC/Gold	Hydrogen Zerog	P
4.39 NP	April 21	WI	S	LRC/Gold	Hydrogen Zerog	S
4.42 NP	Aug. 12	WI	S	LRC/Plohr	Hydrogen Zerog	P
4.40 NP	Oct. 18	WI	S	LRC/Regetz	Hydrogen Zerog	S
	1962					
4.41 NP	Feb. 17	WI	S	LRC/Dillon	Hydrogen Zerog	S
4.46 NP	May 8	WI	P	JPL/Brown	Radar	X
4.26 NP	June 20	WI	S	LRC/Flagge	Hydrogen Zerog	P
4.47 NP	July 10	WI	S	JPL/Brown	Radar	X
4.27 NP	Nov. 18	WI	S	LRC/Corpas	Hydrogen Zerog	S
	1963					
4.66 NP	May 14	WI	S	LRC/Kinard	Paraglider	X
4.28 NP	June 19	WI	S	LRC/Corpas	Hydrogen Zerog	P
4.32 NP	Sep. 11	WI	S	LRC/Corpas	Hydrogen Zerog	S
	1962					
4.71 UP	June 29	WI	S	JHU/Depew	Airglow	S
4.72 UP	29	WI	S	JHU/Depew	Airglow	S

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PART III
NASA SOUNDING ROCKET FLIGHTS (Cont.)

NASA NO.	FIRING			PRINCIPAL NASA SCIENTIST / COOPERATING INVESTIGATOR	EXPERIMENT	RESULTS*
	DATE	SITE	PERF*			
				TEST AND SUPPORT		
	1959					
2.01 GT	May 14	WI	X	Medrow	Rocket Test	S
2.02 GT	15	WI	X	Medrow	Rocket Test	S
2.03 GT	15	WI	X	Medrow	Rocket Test	X
2.04 GT	Aug. 7	WI	X	Medrow	Rocket Test	X
2.05 GT	7	WI	X	Medrow	Rocket Test	X
2.06 GT	7	WI	X	Medrow	Rocket Test	S
8.01 GT	Dec. 22	WI	S	GSFC/NRL/DRTE	X248 Vib. Test	S
	1960					
8.02 GT	Jan. 26	WI	S	GSFC/NRL/DRTE	X248 Vib. Test	S
4.01 GT	Feb. 16	WI	X	Medrow	Rocket Test	X
4.12 GT	Mar. 25	WI	S	Medrow	Rocket Test	S
4.10 GT	April 23	WI	S	Medrow	Rocket Test	S
5.01 GT	July 22	WI	S	Sorgnit	Rocket Test	S
3.28 GT	Aug. 9	WI	S	Sorgnit	Rocket Test	S
5.02 GT	Oct. 18	WI	S	Sorgnit	Rocket Test	S
3.29 GT	Nov. 3	WI	S	Sorgnit	Rocket Test	S
	1961					
3.36 GT	Jan. 17	WI	S	Sorgnit	Rocket Test	S
5.03 GT	19	WI	X	Sorgnit	Rocket Test	P
10.49 GT	Mar. 15	WI	S	Sorgnit	Cajun Fin Test	S
4.19 GT	April 14	WI	S	Russell	Attitude Control	P
12.01 GT	May 2	WI	S	U/M-Spencer	Cone Test	S
14.01 GT	25	WI	S	Sorgnit	Rocket Test	S
4.20 GT	June 26	WI	S	Russell	Attitude Control	P
14.02 GT	Aug. 16	WI	S	Sorgnit	Rocket Test	S
	1962					
4.68 GT	Jan. 13	WI	S	Russell	Attitude Control	S
10.69 GT	Mar. 1	WI	X	Donn	Water Launch	S
10.70 GT	2	WI	S	Donn	Water Launch	S
4.48 GT	May 25	WI	S	Pressly	Sea Recovery	S
4.60 GT	Aug. 8	WI	P	Russell	Attitude Control	P
	1963					
16.01 GT	April 8	WI	X	Sorgnit	ACS Test	X
4.87 GT	June 17	WI	S	Russell	Attitude Control	S
14.111 GT	Oct. 31	WI	S	Williams	Vibration Test	S

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NASA SOUNDING ROCKET FLIGHTS (Cont.)

NASA NO.	FIRING			PRINCIPAL NASA SCIENTIST / COOPERATING INVESTIGATOR	EXPERIMENT	RESULTS*
	DATE	SITE	PERF*			
	1964					
4.88 GT	Jan. 28	WI	S	Russell	Attitude Control	S
14.28 GT	Feb. 12	WI	S	Sorgnit	Rocket Fin Test	S

NUMBER OF VEHICLES FIRED 1959 – 1963

AEROBEE 100	14
ARCON	6
NIKE ASP	27
AEROBEE 150	20
AEROBEE 150A	53
IRIS	4
AEROBEE 300/300A	8
JAVELIN	18
SKYLARK	4
NIKE CAJUN	104
JOURNEYMAN	5
SPECIAL	1
NIKE APACHE	52
ASTROBEE 1500	1

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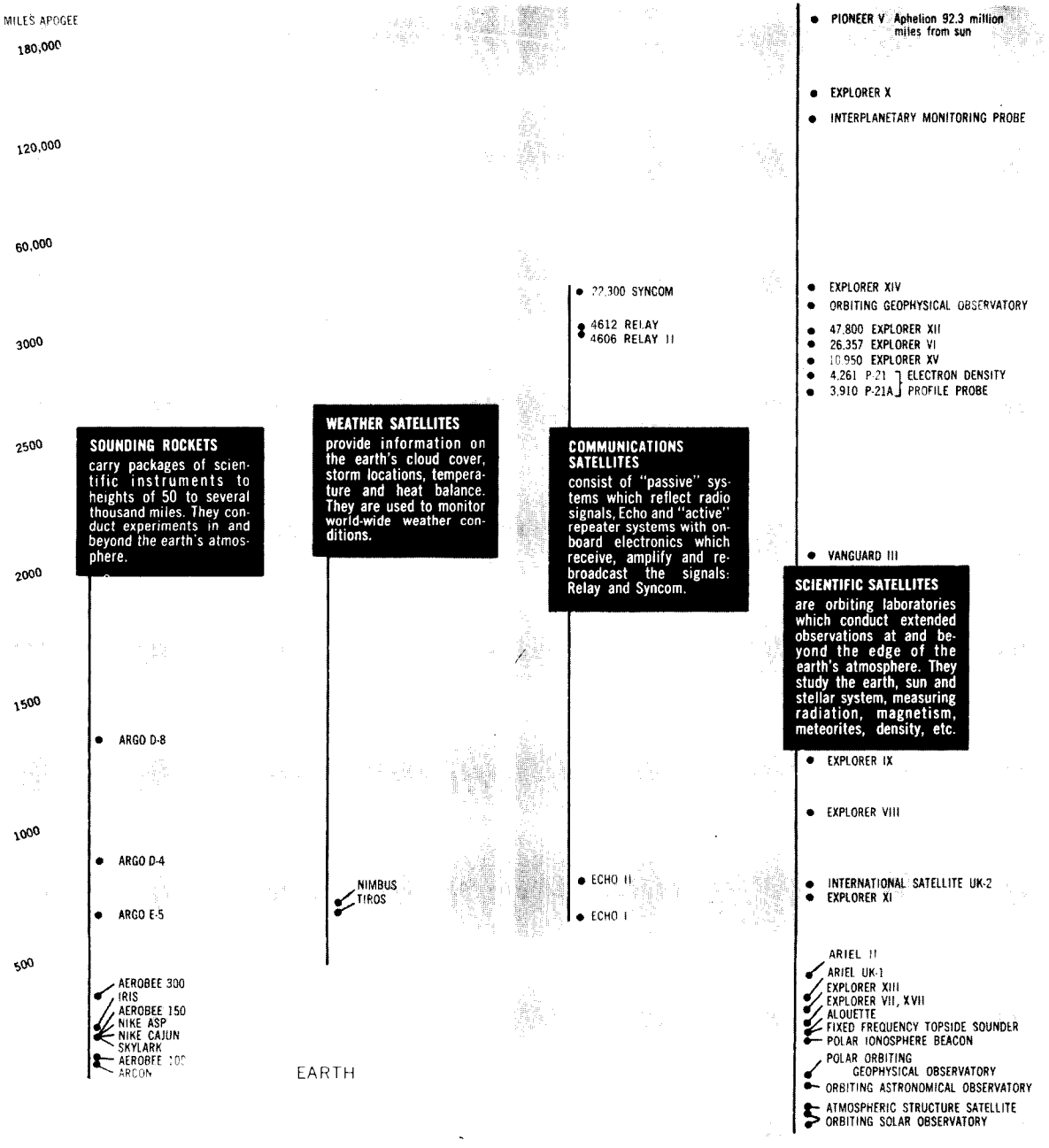

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